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118(3522)

118(3522

Proceedings of the United States National Museum

SMITHSONIAN INSTITUTION • WASHINGTON, D.C.

Number 3522 1965 Volume 118, Pages 1–46

FEB 28 1966
FISH & WILDLIFE SERVICE

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By J. LAURENS BARNARD

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the United States
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The family Ampithoidae is confined to littoral and sublittoral marine depths of the world, generally in the canopies of kelp or shallow rock bottoms where short-tufted algae grow. Being large-bodied organisms, they are among the most conspicuous amphipods. Indeed, the largest amphipod so far reported in shallow waters of southern California is *Cymadusa uncinata* (herein a specimen 35 mm. long). The world fauna supports eight genera (not including *Amphitholina*, which was transferred to the Eophliantidae by Gurjanova in 1958), but only two of these have been found in the present collections, *Ampithoe* and *Cymadusa*. A fragmentary specimen of a third genus, probably *Paragrubia*, has been found at Cayucos, Calif.

The present collections consist of materials dredged by the *Velero III* of the Hancock Foundation, especially in the channel islands off southern California, and materials of intertidal origin collected by the writer and other workers from Cayucos to La Jolla, Calif. A few samples collected by scuba diving have proved most valuable. There is a need for more extensive diving exploration of kelp holdfasts and canopies and other algal bottoms.

Ampithoids bear spinning glands in pereopods 1 and 2, which are used to form soft parchment-like tubes for inhabitation. Apparently the tubes are formed mostly among the holdfasts of kelps, smaller algae, and surfgrass. Limbaugh in a mimeographed report from Scripps Institution of Oceanography reported on an *Ampithoe* that rolls up the edge of a *Macrocystis* blade, "stitches" it along the seam, and lives in the enclosed tube. Ampithoids follow algae down to their photic limit; hence ampithoids live to greater depths in the channel islands off southern California, where the waters are clearer, than along the mainland shelf where the waters are quite turbid and algae rarely grow below 30 meters.

I am indebted to the National Science Foundation for a grant (G-10750) that supported the illustration of this work, and to the Beaudette Foundation for my support. Portions of the materials are deposited in the U.S. National Museum and the Allan Hancock Foundation, University of Southern California.

Key to Species of World *Ampithoe*

1. Third pleonal epimeron with a point at the lower posterior corner . . . 2
   Third pleonal epimeron rounded at lower posterior corner 4
2. Male gnathopod 1: fifth article 1.8 times as long as article 6.
   tarasovi (check *mitsukurii* also)
   Male gnathopod 1: fifth article subequal to or shorter than article 6 . 3
3. Flagellum of antenna 1 shorter than flagellum of antenna 2 . **australiensis**
   Flagellum of antenna 1 almost twice as long as flagellum of antenna 2.
   lacertosa (=**scitula**)
4. Gnathopod 1: palm distinctly transverse, short, corner sharply quadrate, article 6 linear, posterior edge straight, article 7 greatly overlapping palm (fig. 1*a*) 5
   Gnathopod 1: palm, if present, oblique 14
5. Flagellum of second antenna 2–4 articulate or very stout (fig. 1*n*) . . . 6
   Flagellum of second antenna slender or more than 8-articulate (fig. 1*m*) . 8
6. Article 2 of pereopods 3–5 quite narrow, linear . . . . . **plea**
   Article 2 of pereopods 3–5 broad, biconvex 7
7. Lobe of article 5 on male gnathopod 2 acute . . **brevipes** (of Bate 1862)
   Lobe of article 5 on male gnathopod 2 obtuse but narrow . . . . **lindbergi**
8. Male gnathopod 2 similar to gnathopod 1 . . . . . **humeralis**
   Male gnathopod 2 much larger than gnathopod 1 9
9. Palm of male gnathopod 2 minutely and irregularly serrate its full length . . . . . **annenkovae**
   Palm of male gnathopod 2 not serrate for its full length.
   femorata, brevipes, falsa, orientalis, and those of couplet 10
10. Gnathopod 1: article 6 extremely slender (fig. 1*a*).
    orientalis (of J. L. Barnard 1955)
    Gnathopod 1: article 6 moderately stout 11
11. Female gnathopod 2: palm transverse 12
    Female gnathopod 2: palm oblique 13

12. Article 4 of antenna 2 shorter than article 5 . species of southern California
Article 4 of antenna 2 as long as or longer than article 5 . **tea**, new species
13. Pereopod 5: article 5 twice as broad as article 6, subequal to 6 in length . . . . . **eoa**
Pereopod 5: article 5 not broader but much shorter than article 6 . . . **mea**
14. Male gnathopod 2 with tooth defining palm 15
Male gnathopod 2 lacking palmar defining tooth 18
15. Palm of gnathopod 2 transverse, bearing bilobed tubercle in middle of palm . . . . . **mitsukurii** (see also *valida*)
Palm of gnathopod 2 oblique, or with long hind tooth 16
16. Distal lobules of lower lip equal in size . . . . . **pollex** and **volki**
Lateral distal lobules of lower lip much longer than medial lobules . . . 17
17. Article 6 of male gnathopod 2 not produced anterodistally. **simulans** (=**dalli**), **kussakini**
Article 6 of male gnathopod 2 produced into a setose lobe anterodistally **ramondi**
18. Male antenna 2 with dense tufts of setae 19
Male antenna 2 lacking dense tufts of setae 23
19. Male gnathopod 2: hind margin of article 6 and palm equal in length . . 20
Male gnathopod 2: hind margin of article 6 much longer than palm . . 21
20. Article 5 of gnathopod 1 shorter than article 6 . . . . . **alluaudi**
Article 5 of gnathopod 1 much longer than article 6. **brasiliensis** (of Oliveira 1953)
21. Dense setal tufts of antenna 2 confined to article 5 of peduncle and flagellum . . . . . **plumulosa**
Dense setal tufts of antenna 2 borne on articles 4–5 of peduncle and flagellum 22
22. Finger of gnathopod 1 matching palm . . . . . **brasiliensis** and **africana**
Finger of gnathopod 1 overlapping palm . . . . . **zachsi**
23. Palm of male gnathopod 2 with a process (not defining) 24
Palm of male gnathopod 2 lacking a process 26
24. Palm of male gnathopod 2 transverse . . . . . **valida** (see also *mitsukurii*)
Palm of male gnathopod 2 oblique 25
25. Palm of male gnathopod 2 equal to hind margin of article 6 . . . **grubiformis**
Palm of male gnathopod 2 much shorter than hind margin of article 6. **senegalensis**
26. Palm of male gnathopod 1 moderately excavate (fig. 1*e*) 27
Palm of male gnathopod 1 not excavate 30
27. Hind lobe of article 5 on gnathopod 1 truncated 29
Hind lobe of article 5 on gnathopod 1 rounded 28
28. Male gnathopod 2: article 6 half as wide as long, flagellum of antenna 1 twice as long as flagellum of antenna 2 . . . . . **rubricata**
Male gnathopod 2: article 6 three-fourths as wide as long, flagellum of antennae 1–2 subequal in length . . . . . **rubricatoides**
29. Article 5 of gnathopod 1 nearly as long as article 6 . . **djankonovi** (in part)
Article 5 of gnathopod 1 half as long as article 6 . . . . . **marcuzzii**
30. Palm of male gnathopod 2 transverse . . . . . **japonica** (in part)
Palm of male gnathopod oblique 31
31. Distal lobules of lower lip equal in size (fig. 1*l*) . . . . . **japonica** (in part)
Distolateral lobules of lower lip much larger than medial lobules (fig. 1*j*) . 32

32. Palm of male gnathopod 1 short, scarcely evident, finger overlapping palm considerably, article 6 linear (fig. 1*d*) . . . . . **longimana**
Palm of male gnathopod distinct, long, finger matching palm, article 6 suboval (fig. 1*c*) . . . . . **djankonovi** (in part)

Not included in the key are *A. kergueleni* Stebbing (1888), a female, but see Chevreux (1927) for a possibly correct assignment of a male; *A. megaloprotopus* Stebbing (1895), which probably belongs in the genus *Exampithoe* because of its enlarged first gnathopod.

Notes on the Literature of *Ampithoe*

The genus *Ampithoe* and many of its species are nomenclaturally quite old. Several species have been based on females or juveniles, and this early confusion still has not been straightened out.

The most important and involved situation is that concerning *Ampithoe femorata* Krøyer and *A. brevipes* Dana. Stebbing (1906), without new material, recognized both species but noted their close affinities. By evidence of his synonymies, he considered *A. gaudichaudii* Milne Edwards a senior synonym of *A. femorata*, and he included questionably in *A. brevipes* the species *A. peregrina* Dana and *A. falklandi* Bate. These species are scattered widely in the Southern Hemisphere on both sides of South America. Chilton (1921) also reported *A. femorata* from the Juan Fernandez Islands.

Schellenberg (1931) combined *femorata* and *brevipes* and their synonyms, including K. H. Barnard's (1916) reference to *brevipes*. K. H. Barnard (1932) gave a new name, *falsa*, to his 1916 *brevipes* identification from South Africa, but reported on *brevipes* from the Falkland Islands and mentioned *A. chilensis* as a possible synonym. Stephensen (1949) reported *brevipes* from Tristan da Cunha (again) noting the characteristic swelling of article 4 of pereopods 1–2. J. L. Barnard (1952) erroneously identified *femorata* from California. In retrospect, I relied upon Bate's (1862) figure of *brevipes* (pl. 43, fig. 2) showing the short flagellum of antenna 2. My identification should be referred to *A. lindbergi*. The early drawings and descriptions of *brevipes*, *falklandi*, *peregrina*, *gaudichaudii*, and *chilensis* leave much to be desired in comparison to the better described *A. femorata*. The gnathopods of the supposedly female *falklandi* are rather stouter than expected for *brevipes*, and the fifth article has a posterior lobe. I strongly question that *falklandi* is a synonym of *brevipes*, as figured in the literature, although *falklandi* seems to fit *brevipes* as to be expected of a female. There are discrepancies in the stoutness of article 4 of pereopods 1–2 in the various figures of Bate (1862). Considering the situation in California of several Ampithoes such as *humeralis*, *lindbergi mea*, *tea*, and *plea*, all very difficult to separate in female, juvenile, and

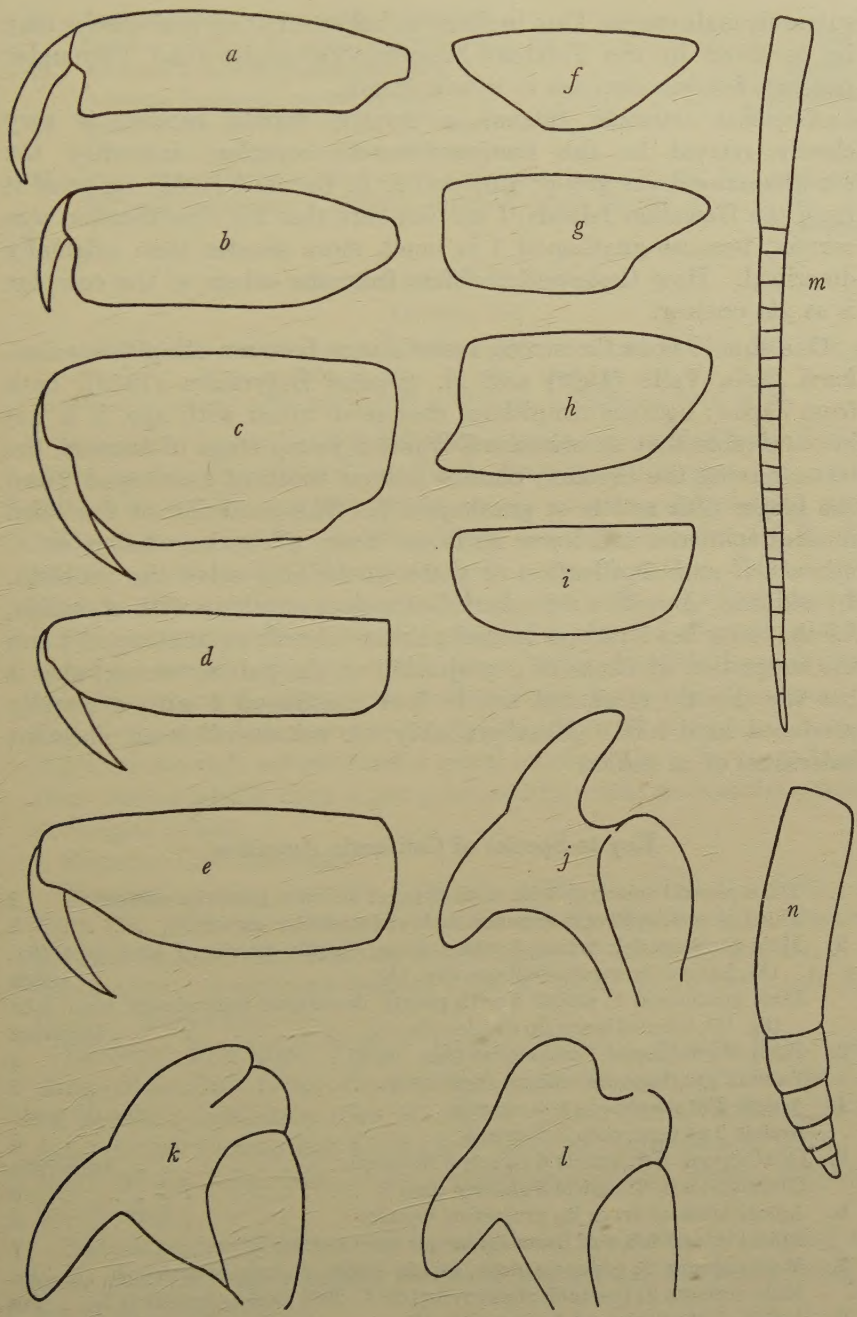

FIGURE 1.—Schematic diagrams of gnathopods, lower lips, and second antennae as represented in keys of *Ampithoe: a–e*, articles 6–7 of first gnathopods; *f–i*, article 5 of first gnathopods; *j–l*, lower lips (halves); *m*, *n*, second antennae.

subadult male stages, I am inclined to believe that several species may be involved in the Falkland-Magellan-Valparaiso-Juan Fernandez *femorata-brevipes* complex as it now stands.

Ampithoe orientalis (Dana), a tropical Pacific species, is very closely related to the *brevipes-femorata* complex, including the *eoa-mea-annenkovae* group; although J. L. Barnard (1955) reported it from the Hawaiian Islands, I am not sure that his identification was correct, because gnathopod 1 is much more slender than originally described. How that species differs from the others of the complex is as yet unclear.

One should note the strong resemblance between *Ampithoe mitsukurii* Della Valle (1893) and *A. tarasovi* Bulycheva (1952), both from Japan; because Ampithoes change so much with age, it is not inconceivable that *A. mitsukurii* is but a young stage of *tarasovi*, the latter having the broader, blunter palmar tooth of gnathopod 2 and the longer fifth article of gnathopod 1. The condition of the third pleonal epimeron and lower lip is not clear, to my knowledge, in *A. mitsukurii* and clarification of these would help solve the problem. In addition, *Ampithoe mitsukurii* bears close checking with *A. valida*, for the latter has a narrow medial palmar tubercle on gnathopod 2 and the suggestion at times of a projection at the palmar corner; also it has the slightly elongated article 5 of gnathopod 1 with a distally produced hind lobe. Most probably, *A. mitsukurii* is an aberrant individual of *A. valida*.

Key to Species of California *Ampithoe*

1. Third pleonal epimeron with a small point at lower posterior corner . . 2
   Third pleonal epimeron rounded at lower posterior corner 3
2. Male gnathopod 1: article 5 with a large, distally produced hind lobe (fig. 1*h*), lobes of lower lip bulbous (fig. 1*k*) . . . . . **valida**
   Male gnathopod 1; article 5 with poorly developed unproduced hind lobe (fig. 1*f*), lobes of lower lip slender (fig. 1*j*) . . . . . **lacertosa**
3. Palm of gnathopod 1 transverse (figs. 1*a*, *b*) 4
   Palm of gnathopod 1 oblique (figs. 1*c*–*e*) 9
4. Article 2 of pereopods 3–5 narrow . . . . . **plea** (in part)
   Article 2 of pereopods 3–5 broad 5
5. Gnathopods 1–2: article 5 equals 6 in length . . . . . **humeralis**
   Gnathopods 1–2: article 5 shorter than 6 6
6. Apical lobes of lower lip projecting equally 8
   Apical lateral lobes of lower lip longer than medial lobes 7
7. Male antenna 2: peduncle stout, article 4 90% as long as article 5 . . sp.
   Male antenna 2: peduncle slender, article 4 120% as long as article 5 . . **tea**
8. Article 6 of gnathopod 1 stout (fig. 1*b*) . . . . . **plea** (in part)
   Article 6 of gnathopod 1 slender (fig. 1*a*) . . . . . **lindbergi**
9. Lobe on article 5 of gnathopod 1 distally produced 10
   Lobe on article 5 of gnathopod 1 rounded behind (figs. 1*f*, *g*, *i*) 12

10. Lobules of lower lip slender, separated 11
    Lobules of lower lip stout, appressed (fig. 1*k*) . . . . . **valida**
11. Antenna 2 normally setose in male . . . . . **ramondi**
    Antenna 2 strongly setose in male . . . . . **plumulosa**
12. Lobules of lower lip bulbous and appressed (fig. 1*k*) . . . . . **pollex**
    Lobules of lower lip slender and separated 13
13. Palm of gnathopod 1 obsolescent, article 5 as long as 6 (fig. 1*d*) . **longimana**
    Palm of gnathopod 1 distinct, article 5 much shorter than 6 (fig. 1*e*). **simulans**

Ampithoe humeralis Stimpson

FIGURES 2–3

Amphithoe [sic] *humeralis* Stimpson, 1864, p. 156.—Calman, 1898, pp. 271–273, pl. 33, fig. 4.—Holmes. 1904, p. 241.—Hewatt, 1946, pp. 199, 204.
Ampithoe humeralis.—Stebbing, 1906, p. 636—J. L. Barnard, 1954, p. 29.

Diagnosis: Second and third pleonal epimera rounded behind, with slight lateral ridges; article 5 of male gnathopod 1 longer than article 6, hind edge truncated, not lobate, article 6 rectangular, slender, palm transverse or slightly chelate, finger overlapping palm by its full length; gnathopod 2 like gnathopod 1 except article 5 is slightly shorter, although longer than article 6, and with a distinct, rounded hind lobe; article 6 like that of gnathopod 1; article 2 of pereopods 1–2 about 1.7 times as long as broad; ventral edge of article 1 on antenna 1 lacking ventral spines; antenna 1 much longer than antenna 2, flagellum about four times as long as flagellum of antenna 2, neither flagellum strongly setose; lateral apical lobule of lower lip much longer than medial lobule, coxa 1 not produced forward; peduncular process or uropod 1 long.

Female: Like the male.

Material: *Velero* stations 1206 (7), 1409 (5), 1489 (1), 2052 (1), 4806 (2), 4822 (2). Barnard stations 33 (1), 42–C–7 (1). Oceanographic Lab., Friday Harbor, Wash., Aug. 16–29, 1949, coll. Dr. J. L. Mohr (13). Guadalupe Island, Dec. 9, 1946, 26–29 fms., coll. Dr. Carl L. Hubbs (1).

Records: Intertidal: Friday Harbor, Wash.; North Bay, Cape Arago State Park, Oreg.; Hazard Reef, S. of Morro Bay, Calif. Islands off southern California: San Nicolas 4–9 fms.; Santa Barbara, 26–39 fms. Point Conception, Calif., 8–9 fms.; off Long Beach, Calif., 13 fms.; Off La Jolla, Calif., 1 fm. Guadalupe Island, Baja California, 26–29 fms.

Relationship: This species is unique in *Ampithoe* for having the male and female gnathopods identical, the male gnathopod 2 being as small as gnathopod 1.

Young males and females are difficult to separate from *A. plea*, *A. lindbergi*, *A. mea*, and *A. tea*.

Distribution: Puget Sound to Guadalupe Island.

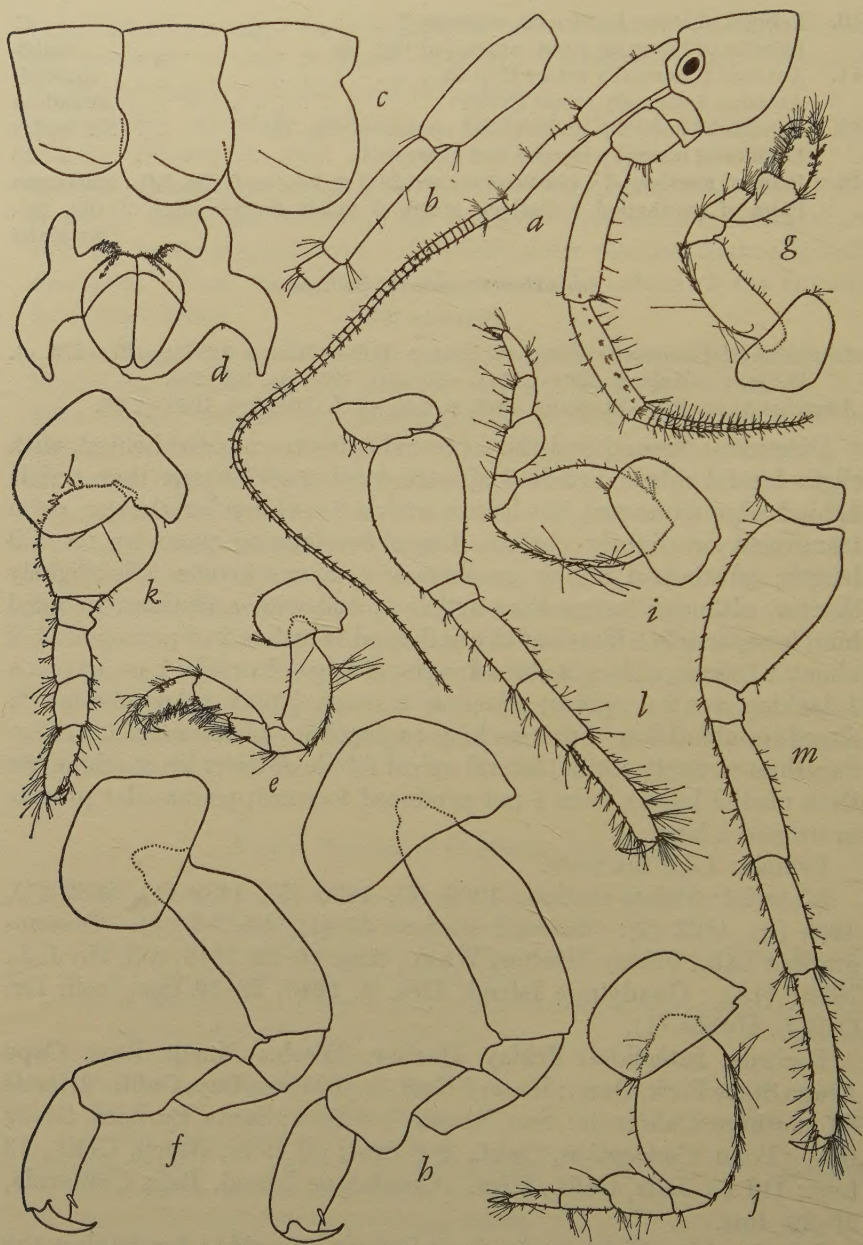

FIGURE 2.—*Ampithoe humeralis* Stimpson, male, 22 mm., sta. 1206: *a*, head; *b*, peduncle of antenna 1; *c*, metasome; *d*, lower lip; *e*, *f*, gnathopod 1; *g*, *h*, gnathopod 2; *i*–*m*, pereopods 1, 2, 3, 4, 5.

FIGURE 3.—*Ampithoe humeralis* Stimpson, male, 22 mm., sta. 1206: *a–d*, uropods 1, 2, 3, 3; *e*, telson; female, 19 mm.: *f*, *g*, gnathopods 1, 2.

Ampithoe lacertosa Bate

FIGURES 4–5

Amphithoë [sic] *lacertosa* Bate, 1858, p. 362; 1862, pp. 236–237, pl. 41, fig. 5.
Ampithoe lacertosa.—Stebbing, 1906, pp. 633–634.—J. L. Barnard, 1954, pp. 31–33, pls. 29–30.—Nagata, 1960, pp. 175–176, pl. 16, figs. 95–96.
Amphithoë macrurus Stephensen, 1944, pp. 80–83, figs. 30–31.
Dexamine scitulus Harford, 1877, p. 116.
Amphithoë scitulus Holmes, 1904, pp. 314–315, pl. 36, figs. 21–24.
?*Amphithoë Stimpsoni* Boeck, 1871, pp. 14–15, fig. 5.

Diagnosis: Second and third pleonal epimera with a point at the lower posterior corners; articles 5 and 6 of male gnathopod 1 subequal in length, posterior edge of article 5 formed of a broad, flat lobe bluntly projecting distally, palm oblique; male gnathopod 2 with large rounded lobes on articles 2 and 3, article 5 with an intermediate-sized hind lobe, article 6 greatly elongated, subrectangular, palm transverse, slightly sinuous, slightly cheliform, dactylus stout, fitting palm, apically blunt; article 2 of pereopods 1–2 about 2.2 times as long as broad; ventral edge of article 1 of antenna 1 with several spines; antenna 1 reaching farther than antenna 2, its flagellum about twice as long as flagellum of antenna 2, both flagella poorly setose, but long and with numerous articles; outer apical lobule of lower lip twice as long as inner lobule, peduncle of uropod 3 elongated; peduncular process of uropod 1 poorly developed.

FIGURE 4.—*Ampithoe lacertosa* Bate, male, 22 mm., sta. 1455: *a*, lower lip; *b*, article 1 of antenna 1; *c*, gnathopod 1; *d*, *e*, gnathopod 2; *f–j*, pereopods 1, 2, 3, 4, 5; *k*, *l*, ends of pereopods 3, 5; *o*, metasome; male, 11 mm., Barnard sta. 33: *m*, *n*, gnathopods 1, 2.

Females: Article 5 of gnathopod 1 ranging from shorter to longer than article 6 (the latter, see Nagata, 1960), the larger the female, the longer is article 5. Hence, the gnathopods of young females may be confused with those of *A. valida* and indeed are like those figured

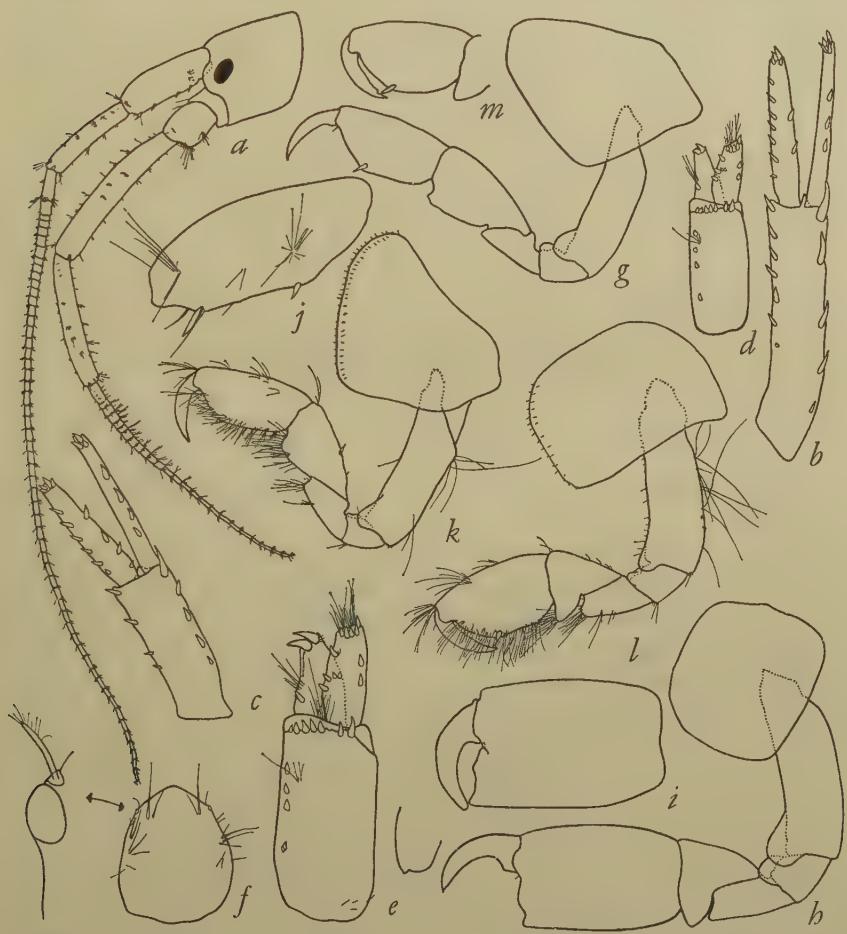

FIGURE 5.—*Ampithoe lacertosa* Bate, male, 22 mm., sta. 1455: *a*, head; *b–e*, uropods 1, 2, 3, 3; *f*, telson; male, 15 mm., Barnard sta. 33: *g–i* gnathopods 1, 2, 2; female, 12.5 mm., Barnard sta. 33: *j*, article 1 of antenna 1; *k–m*, gnathopods 1, 2, 2.

by Nagata for *A. valida*. Gnathopod 2 with article 5 like the male article 5 of gnathopod 2; article 6 a slightly stouter version of the same article in gnathopod 1.

Material: *Velero* stations 1455 (1), 1646 (1). Barnard station 33 (12).

Records: California: Pacific Grove, intertidal; Santa Catalina Island, intertidal; La Jolla, 1 fm.

Remarks: *Dexamine scitulus* Harford, the type of which was refigured by Holmes (1904), apparently is a female of this species.

The most important clues are the lengths of the antennal flagella and the produced points of the second and third pleonal epimera, unique to this species.

Possibly *A. stimpsoni* Boeck, from San Francisco, represents a young male of this species, although it could also represent *A. japonica* Stebbing or *A. djakonovi* Gurjanova, two species which may occur in northern California. Bate (1862) shows this species having uropod 3 exceeding the end of uropod 2 by a considerable degree. In these southern specimens of smaller size, this is not the case.

Distribution: "Arctic Seas" (Bate 1862), a cold temperate species barely penetrating to tropical limits in the warm temperate, from Kodiak Alaska, south to the Shizueka Prefecture in Japan and to Magdalena Bay in Baja California, with records from Oregon, Puget Sound, and southern California.

Ampithoe lindbergi Gurjanova

FIGURES 6–7

Amphithoe [sic] *lindbergi* Gurjanova, 1938, pp. 351–354, fig. 49; 1951, pp. 892–895, fig. 620.

Ampithoe femorata Krøyer.—J. L. Barnard, 1952, pp. 24–28, pls. 6–7 (not Krøyer, 1845).

Diagnosis: Second and third pleonal epimera rounded behind; article 6 of male gnathopod 1 slightly longer than article 5, posterior edge of article 5 with a broadly truncated posterior lobe, article 6 slender, rectangular, palm short, transverse, finger greatly overlapping palm; gnathopod 2 of male with subrectangular article 6, palm oblique, slightly concave, but clearly defined, minutely crenulate at defining area, palm shorter than hind margin of article 6, finger short, fitting palm or slightly overlapping it, article 2 with poorly developed distal bump; article 2 of pereopods 1–2 about 2.0 times as long as broad; ventral edge of article 1 on antenna 1 with at least one spine; antenna 1 longer than antenna 2, flagellum nearly four times as long as flagellum of antenna 2; flagellum of antenna 2 very short, stout, strongly setose, progressively decreasing in male in number of articles from about 6 to 3; apical lobules of lower lip short, subequal in length; coxa 1 not produced forward; peduncular process of uropod 1 long.

Female: Gnathopod 1 similar to that of male, article 5 slightly shorter; gnathopod 2 like gnathopod 1 but article 5 even shorter and with moderately well-developed, but rather stout hind lobe; antenna 2 generally with 1–3 more flagellar articles than in male.

Material: *Velero* station 1664 (15). Barnard stations 27 (3), 42–T–5 (1 juv.?), 42–T–6 (2), 42–T–7 (1), 42–C–7 (2), 43–B–3 (2). Point Fermin, Calif., Jan. 14, 1949, coll. Dr. J. L. Mohr (2).

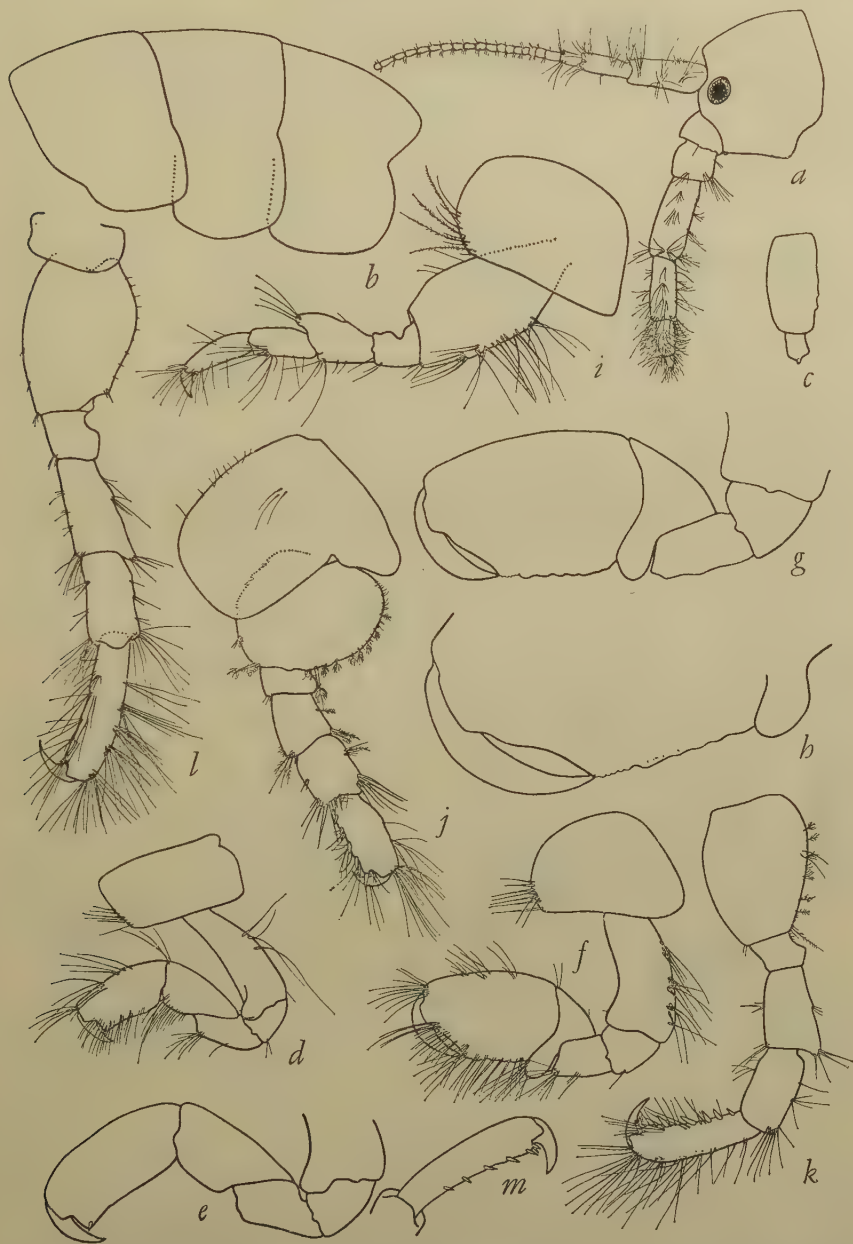

FIGURE 6.—*Ampithoe lindbergi* Gurjanova, male, 12.0 mm., sta. 1664: *a*, head; *b*, metasome; *c*, flagellum of antenna 2; *d*, *e*, gnathopod 1; *f–h*, gnathopod 2; *i–l*, pereopods 1, 3, 4, 5; *m*, end of pereopod 5.

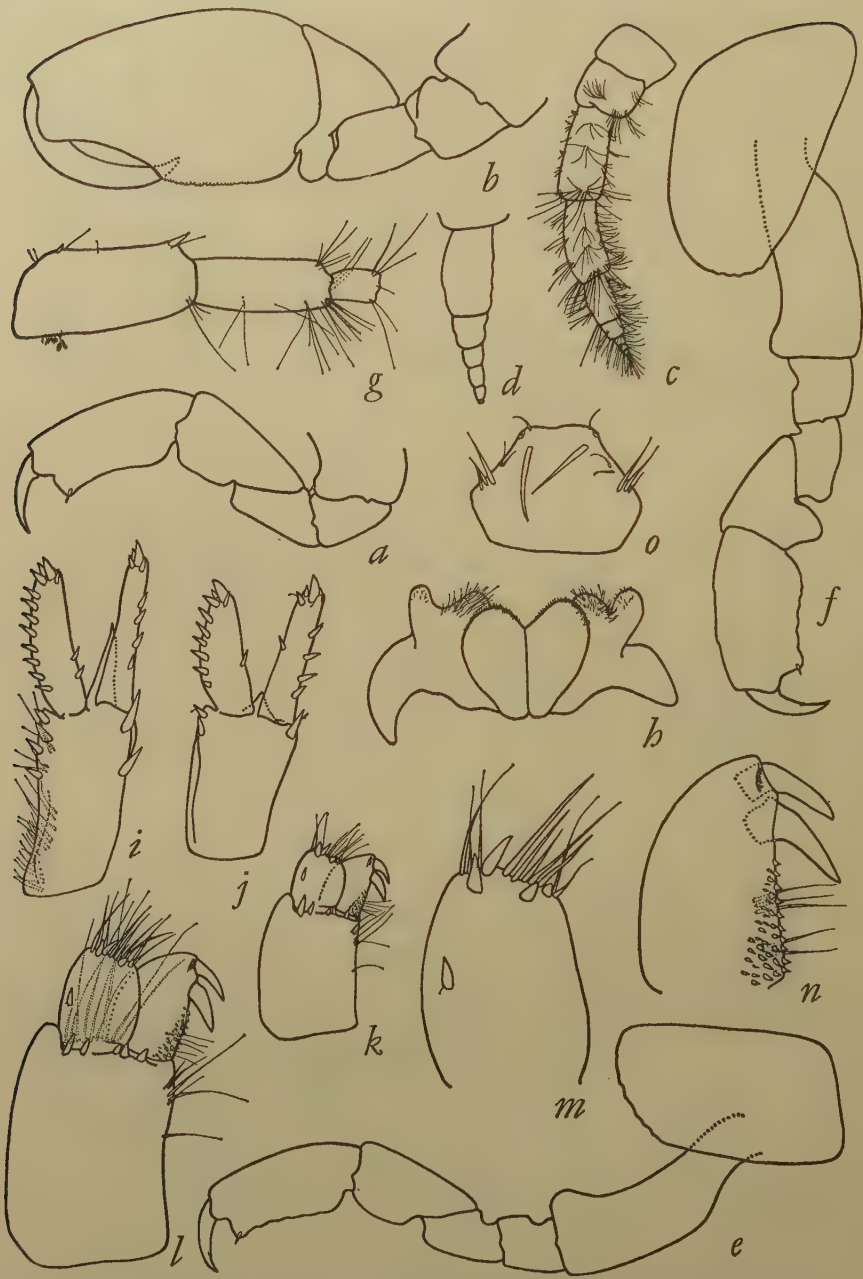

FIGURE 7.—*Ampithoe lindbergi* Gurjanova, station 1664: *a*, *b*, gnathopods 1, 2, male, 11.5 mm.; *c–g*, female, 9.0 mm.: *c*, antenna 2; *d*, flagellum of antenna 2; *e*, *f*, gnathopods 1, 2; *g*, peduncle of antenna 1; *h–o*, male, 12.0 mm.: *h*, lower lip; *i–l*, uropods 1, 2, 3, 3; *m*, *n*, inner and outer rami of uropod 3; *o*, telson.

Records: California intertidal: Cayucos; Hazard Canyon Reef, south of Morro Bay; Point Fermin; Santa Cruz Island.

Distribution: Bering Sea, Okhotsk Sea, Japan Sea to California at Point Fermin, near Los Angeles.

Ampithoe longimana Smith

FIGURE 8

Amphithoë [sic] *longimana* Smith, 1873, pp. 563–564.—Holmes, 1905, p. 509, fig.
Amphithoe longimana.—Kunkel, 1910, pp. 87–90, fig. 34; 1918, pp. 147–149, fig. 43.
Amphithoë longimana.—Pearse, 1912, p. 376.
Ampithoe longimana.—J. L. Barnard, 1959, pp. 36–37, pl. 12.

Diagnosis: Second and third pleonal epimera rounded behind and at lower corners, no lateral ridges; articles 5 and 6 of male gnathopod 1 equal in length, slender, palm obsolescent, finger greatly overlapping the end of article 6, hind edge of article 5 shallow, not lobed, broad, flat; male gnathopod 2 rather small, scarcely larger than gnathopod 1, article 5 shorter than 6 and with subacute hind lobe not strongly projecting, palm oblique, sinuous, sharply defined, finger fitting palm; second articles of both gnathopods with anterodistal lobes; article 2 of pereopods 1–2 about 2.5 times as long as broad; ventral edge of article 1 on antenna 1 with one or two spines; antenna 1 longer than 2, flagellum of antenna 1 about 3 times as long as that of antenna 2, flagella both poorly setose, outer apical lobule of lower lip slightly longer than inner lobule, not appressed; coxa 1 produced forward; peduncular process of uropod 1 vestigial.

Female: Article 5 of gnathopod 1 slightly shorter than article 6, palm better developed than in male; gnathopod 2 like that of male but articles 5 and 6 shorter.

Material: Same as Barnard 1959.

Distribution: Atlantic coast of the United States, from Massachusetts to Florida Bay, Fla.; Bermuda; Pacific America from Bahía de San Quintín, Baja California north to Morro Bay, Calif., confined to embayments and lagoons.

Ampithoe plea, new species

FIGURES 9, 10

Diagnosis: Second and third pleonal epimera rounded behind; articles 5 and 6 of male gnathopod 1 equal in length, posterior edge of article 5 with a truncate, rather broad lobe, article 6 rectangular but not very slender, palm well developed, slightly oblique, well defined, finger scarcely overlapping palm; gnathopod 2 in terminal male with article 6 greatly elongated, the full hind margin representing the palm, with a blunt process near the finger hinge, article 7 long,

curved, reaching to end of palm or the full length of article 6, article 2 with poorly developed distal bump; article 2 of pereopods 1 and 2 about 2.0 times as long as broad; ventral edge of article 1 on antenna

FIGURE 8.—*Ampithoe longimana* Smith, male, 9.0 mm., Newport Bay, Calif. (redrawn after Barnard 1959): *a*, head; *b*, lower lip; *c*, pleonal segment 3; *d*, *e*, parts of antennae 1, 2; *f*, *g*, gnathopods 1, 2; *h–j*, pereopods 2, 3, 5; *k–m*, uropods 1, 2, 3; *n*, telson; female, 9.0 mm.: *o*, *p*, gnathopods 1, 2.

1 with a few distal setae; antenna 1 somewhat longer than antenna 2, flagellum four times as long as that of antenna 2; flagellum of antenna 2 very short, stout, about 8-articulate, article 1 of flagellum

especially stout but elongated, conspicuously setose; lateral apical lobule of lower lip projecting more than medial lobule; coxa 1 not produced forward; peduncular process of uropod 1 long.

Female: Flagellum of antenna 2 slender; gnathopod 1 like male but article 5 slightly shorter than 6, article 6 slightly more slender,

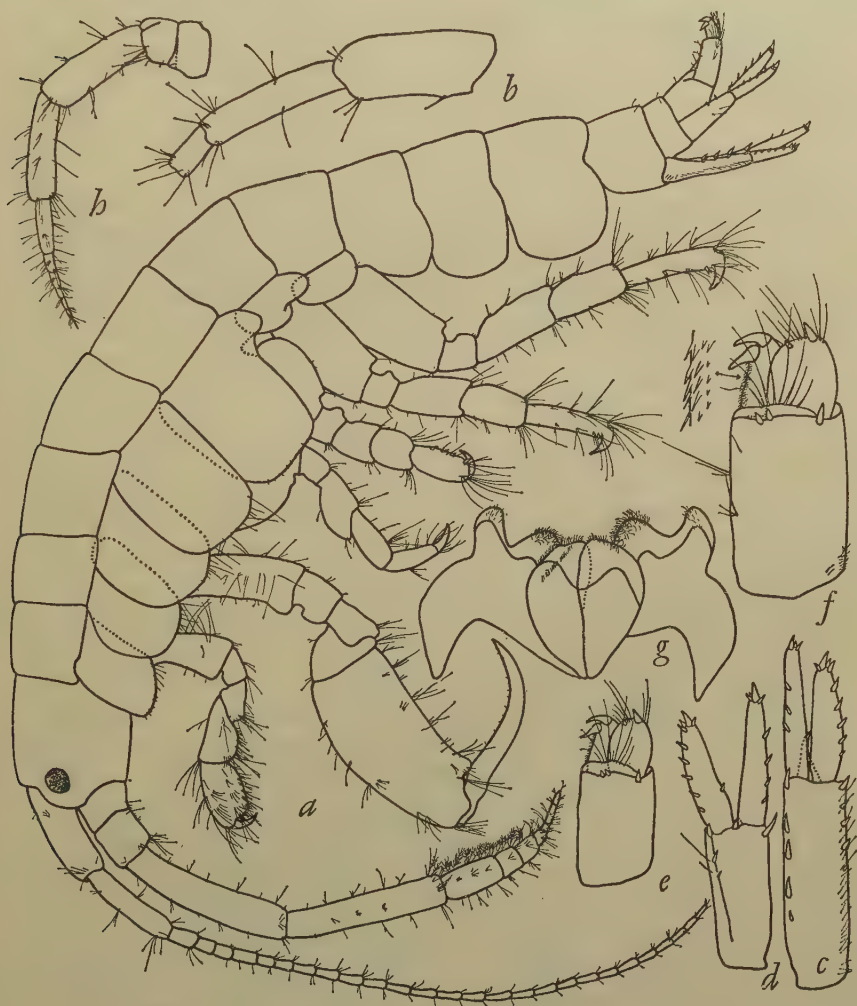

FIGURE 9.—*Ampithoe plea*, new species, holotype, male, 8.5 mm., sta. 4806: *a*, lateral view; *b*, peduncle of antenna 1; *c–f*, uropods 1, 2, 3, 3; *g*, lower lip; female, 7.5 mm.: *h*, antenna 2.

palm shorter and finger shorter; gnathopod 2 like gnathopod 1 but article 5 short, with moderately better developed hind lobe, articles 6 and 7 slightly stouter than in gnathopod 1; article 2 of both gnathopods with posterodistal edge serrate and strongly setose.

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Young male: Gnathopod 2 with shorter finger, process of palm scarcely developed. Apparently with age some second antennal flagellar segments are lost because the young male here has 10 flagellar articles and the terminal male only 8.

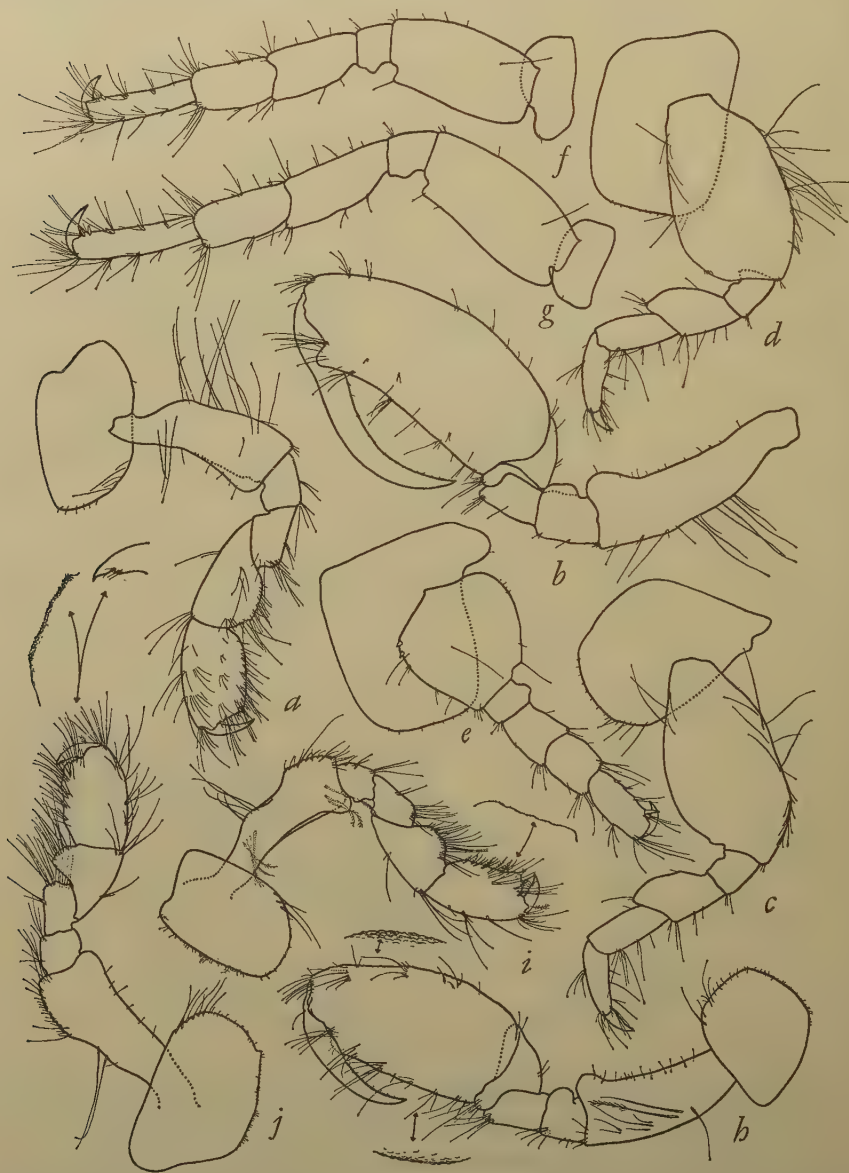

FIGURE 10.—*Ampithoe plea*, new species, holotype, male, 8.5 mm., sta. 4806: *a*, *b*, gnathopods 1, 2; *c*–*g*, pereopods 1, 2, 3, 4, 5; young male, 4.5 mm.: *h*, gnathopod 2; female, 7.5 mm.: *i*, *j*, gnathopods 1, 2.

Holotype: Allan Hancock Foundation No. 5737, male, 8.5 mm.

Type locality: *Velero* station 4806, Palos Verdes Headland, Los Angeles Co., Calif., 33–44–13 N., 118–23–08 W., 8 fms., Jan. 6, 1957.

Material: *Velero* stations 4806 (8), 4823 (1 juv.?) 4956 (1). Campbell station 5 (juv. 1?).

Records: Near Coal Oil Point, Calif., 8 fms.; Goleta, living in holdfast of *Macrocystis pyrifera;* Palos Verdes Headland, Calif.; off Santa Barbara, Calif., 17 m.

Relationship: This species is closely related to *A. orientalis* Dana, as reviewed by J. L. Barnard (1955) but differs by the very short, stout male second antennal flagellum and by gnathopod 1 which is much stouter, especially article 6, its palm well developed and with article 7 scarcely overlapping the palm. The second articles of pereopods 1–5 are more slender in the new species.

Ampithoe mea Gurjanova (see 1951) is another relative, but again its first gnathopod is more slender, the palm shorter, and the finger overlapping the palm more strongly. The second antennal flagellum of *A. mea*, although tending to be short and stout, has 22 articles. The first antenna has a stout spine on peduncular article 1. Probably *A. mea* and *A. eoa* Gurjanova (see 1951) are synonomous despite Gurjanova's careful analysis of their differences in a table on p. 885. For instance, her figure of pereopod 3 (fig. 616) is indeed pereopod 2 and so is not comparable to the third pereopod of *A. eoa*. *Ampithoe mea* is simply a younger stage of *A. eoa*, the male finger on gnathopod 2 being shorter (see *A. orientalis* in J. L. Barnard [1955] and other species of *Ampithoe* herein, where the gnathopodal development is traced) and the disparity in thickness between articles 5 and 6 of pereopod 5 increasing with age. The present new species differs from both *A. mea* and *A. eoa* in the development of a process near the finger hinge in adult male gnathopod 2.

Ampithoe lindbergi Gurjanova (see 1951) is a distinct species also available in the present collections. Its second antenna has the short thick flagellum, but again its first gnathopod is very slender with the strongly overlapping finger; however, one might imagine that its second gnathopod could develop into that of *A. plea* with advancing age. Perhaps there are differences in the second articles of pereopods 3–5 because in the new species they are abnormally slender; they have not been described for the types of *A. lindbergi*.

Ampithoe annenkovae Gurjanova (see 1951) is another species with the long palm and finger of male gnathopod 2. Its second antennal flagellum is slender although only 9-articulate and perhaps the antenna shown is for the female. If so, and the male antenna had been broken, it would be conceivable that *A. annenkovae* males are

simply terminations of those of *A. lindbergi*. The male palmar border of gnathopod 2 in *A. annenkovae* is furnished irregularly with serrate bumps. The female gnathopod 2 of *A. annenkovae* is remarkably like the male second gnathopod of *A. lindbergi*.

Distribution: Southern California.

Ampithoe plumulosa Shoemaker

Figures 11, 12

Ampithoe plumulosa Shoemaker, 1938, pp. 16–19, fig. 1; 1942, p. 39.—J. L. Barnard, 1959, p. 37.

Diagnosis of male: Second and third pleonal epimera rounded behind and at lower corners, no lateral ridges; article 5 of gnathopod 1 shorter than 6, hind edge with a truncated lobe, acutely, but slightly, projecting distally, palm obsolescent; gnathopod 2 with elongated rectangular article 6, palm oblique, sinuous, palmar corner well defined, finger stout, curved, fitting palm, article 5 with narrow subacute hind lobe; second articles of both gnathopods with rounded anterodistal lobes, aberrantly acute in gnathopod 2 (fig. 11*i*); article 2 of pereopods 1–2 about 2.4 times as long as broad; ventral edge of article 1 of antenna 1 spiniferous; antenna 1 longer than 2, its flagellum much longer than that of antenna 2, flagellum of antenna 2 scarcely longer than article 5 of peduncle but more than 20-articulate, flagellum and article 5 of peduncle densely setose; outer apical lobules of lower lip slender and much longer than medial lobules; coxa 1 produced forward; peduncular process of uropod 1 vestigial.

Female: Gnathopod 2 with a more oblique, but less sinuous palm than in male, hind lobe of article 5 more obtuse.

Material: *Velero* stations 878 (1), 1041 (1), 1221 (7), 1440 (1), 1449 (40), 1508 (1), 1509 (4), 2000 (1), 2066 (2), 2080 (19), 4822 (2), 4852 (1), 5364 (3), 5564 (2). Barnard stations 33 (5), 36 (3), 37 (45). Glorietta Bay, San Diego Bay, Mar. 19, 1950, coll. Dr. J. L. Mohr (15); Dana Point, Calif., Jan. 25, 1948, in *Phyllospadix*, coll. Dr. J. L. Mohr (3). Black Warrior Lagoon, Baja California, Mar. 21, 1956, coll. Drs. J. Soule and W. K. Emerson, station 336 (1).

Records: California intertidal at Santa Catalina Island, Newport Bay, Corona del Mar. Baja California intertidal at Punta Eugenia, 20 miles east of Punta Eugenia, Punta Santa Rosalía, Millers Landing on "west" side of Bahia Sebastian Viscaino. Cedros Island on *Phyllospadix*. California subintertidal: near Point Conception 9 fms., Gaviota 8 fms., Point Mugu 9 fms., Anacapa Island 15 fms., Newport 11 fms., La Jolla 1 fm. Mexico: Guaymas.

Distribution: British Columbia to Ecuador.

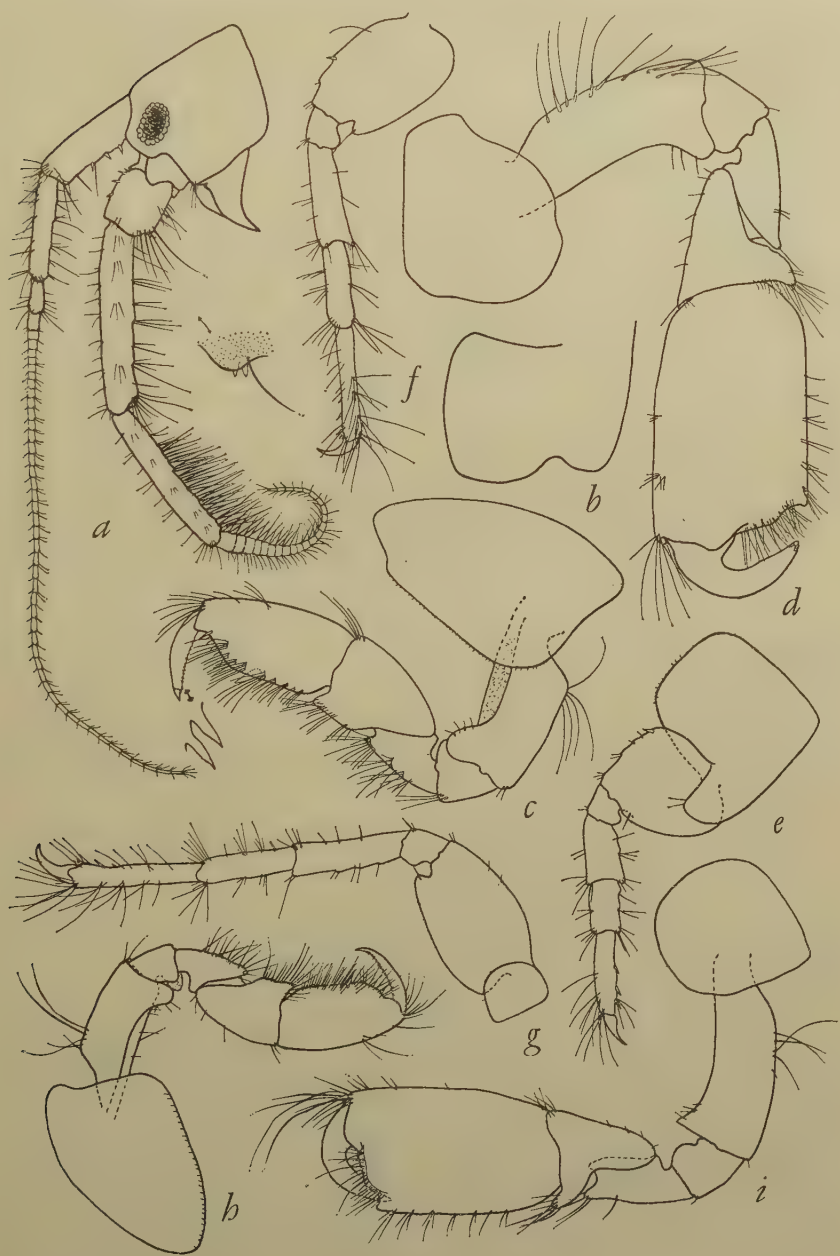

FIGURE 11.—*Ampithoe plumulosa* Shoemaker, male, 13 mm., Bahía de San Quintín: *a*, head; *b*, third pleonal epimeron; *c*, *d*, gnathopods 1, 2; *e–g*, pereopods 3, 4, 5; younger male: *h*, *i*, gnathopods 1, 2.

FIGURE 12.—*Ampithoe plumulosa* Shoemaker, male, 13 mm., Bahía de San Quintín: *a*, lower lip; *b–e*, uropods 1, 2, 3, 3; *f*, telson; female, 12 mm.: *g–i*, gnathopods 1, 2, 2.

Ampithoe pollex Kunkel

FIGURES 13–14

Amphithoe [sic] *pollex* Kunkel, 1910, pp. 92–94, fig. 36.
Ampithoe pollex.—J. L. Barnard, 1954, pp. 29–31, pls. 27–28; 1959, p. 37.
Grubia indentata Stout, 1913, pp. 656–657.

Diagnosis of male: Second and third pleonal epimera rounded on posteroventral corners, no lateral ridges; article 5 of gnathopod 1 shorter than article 6, posterior edge of article 5 with a rounded hind lobe, palm oblique; gnathopod 2 with oblique palm developing a progressively larger detached hind tooth that grows distalward until it overextends a transverse palmar line; a small process overrides the hinge area but is not a part of the palm; finger fitting palm in young, increasingly overlapping the large palmar tooth in old age; second articles of both gnathopods with anterodistal lobes, not strongly prominent in gnathopod 2; article 5 of gnathopod 2 with a slender, subobtuse hind lobe; article 2 of pereopods 1–2 about 3.2 times as long as broad; ventral edge of article 1 of antenna 1 not spiniferous; antenna 2 slightly longer than antenna 1, flagellum of antenna 1

FIGURE 13.—*Ampithoe pollex* Kunkel, male, 5.0 mm., Bahía de San Quíntín: *a*, head; *b*, gnathopod 1; *c*, *d*, gnathopod 2; *e–i*, pereopods 1, 2, 3, 4, 5; young male, 4.0 mm.: *j*, *k*, gnathopods 1, 2.

longer than that of antenna 2, flagella both slender and poorly setose; apical lobules of lower lip about equally short, bulbous, appressed; coxa 1 produced forward; peduncular process of uropod 1 vestigial.

FIGURE 14.—*Ampithoe pollex* Kunkel, male, 5.0 mm., Bahía de San Quintín: *a*, antenna 1; *b*, lower lip; *c*, metasome; *d–g*, uropods 1, 2, 3, 3; *h*, telson; female, 6.0 mm.: *i*, *j*, gnathopods 1, 2.

Females: Palm of gnathopod 2 oblique, about as long as hind margin of article 6, article 5 with subacute hind lobe, broader than in male gnathopod 2.

Material: *Velero* station 1933 (1). Barnard stations 13 (26), 21 (2), 31 (21), 1 (40), 9 (23), 38 (11 samples with 154 specimens), 42 (14

samples with 151 specimens), 43 (10). Estero de Punta Banda (Ensenada), Mar. 21–23, 1951, coll. Dr. J. L. Mohr (20); Laguna Beach, Calif., Jan. 24, 1948, coll. Dr. J. L. Mohr (8); Coronado Yacht Harbor, San Diego Bay, Mar. 19, 1950, coll. Dr. J. L. Mohr (10).

Records: California intertidal at Cayucos, Hazard Canyon Reef, Point Fermin, Corona del Mar, Laguna Beach, San Diego Bay, La Jolla, Santa Catalina Island, Estero de Punta Banda, Baja California.

Remarks: *Ampithoe pollex* is very closely related to *A. folki*, Gurjanova (1938 and 1951); all of the differences that are noted in antennae and gnathopods between the drawings herein and those of Gurjanova (1951) could be attributed to mounting techniques or expressions of infraspeciation.

Distribution: Bermuda; eastern Pacific from Oregon to northern Baja California.

Ampithoe ramondi Audouin

FIGURES 15, 16

Ampithoe ramondi.—Shoemaker, 1942, p. 40.—J. L. Barnard, 1955, pp. 28–29 (with references).

Diagnosis: Second and third pleonal epimera rounded behind; article 5 of male gnathopod 1 shorter than 6, hind lobe truncate, poorly developed, article 6 rectangular and rather slender, palm very oblique and poorly developed but defined by a strong spine, finger overlapping palm; gnathopod 2 with oblique and excavate palm strongly defined by a subacute process, distal anterior end of article 6 strongly produced, heavily setose, article 6 rather long for the genus, with a moderately developed, broad and blunt hind lobe, article 2 with a large blunt lobe at anterodistal corner; article 2 of pereopods 1–2 about 2.5 times as long as broad; ventral edge of article 1 on antenna 1 setose, antenna 1 longer than antenna 2, flagellum 2.5 times as long as flagellum of antenna 2, antenna 2 moderately setose, flagellum slender, slightly longer than peduncular article 5; lateral apical lobule of lower lip projecting strongly, medial lobule very broad, blunt, scarcely projecting; coxa 1 produced forward; peduncular process of uropod 1 vestigial. Body bleached clear in alcohol, eyes dense eosin in color.

Female: Gnathopod 1 like that of male, gnathopod 2 typical of *Ampithoe*, with short article 5 having a somewhat broader lobe than normal, palm oblique, slightly concave.

Material: *Velero* stations 1378 (1), 4861 (2), 4938 (2), 5631 (2), 6206 (5).

Records: The medial apical lobule of the lower lip figured by Chevreux and Fage (1925) (as *A. vaillanti*) is more slender and more projecting than in the present material from California.

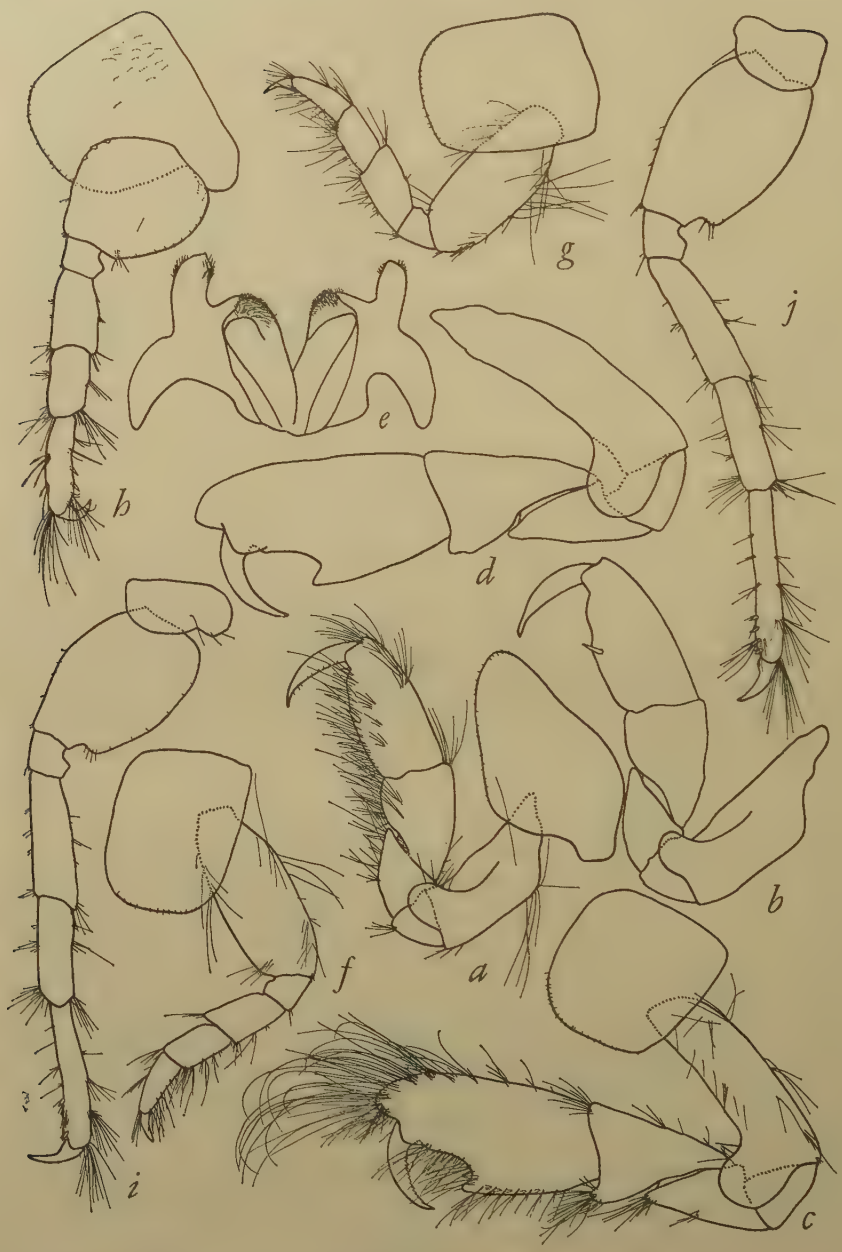

FIGURE 15.—*Ampithoe ramondi* Audouin, male, 11.5 mm., sta. 6206: *a*, *b*, gnathopod 1; *c*, *d*, gnathopod 2; *e*, lower lip; *f–j*, pereopods 1, 2, 3, 4, 5.

Relationship: This species resembles *A. simulans* in its juvenile form but differs by the distally produced article 5 of gnathopod 1.

Distribution: Circumtropical. Most northerly mainland shelf record in California is at San Mateo Point, north of Oceanside.

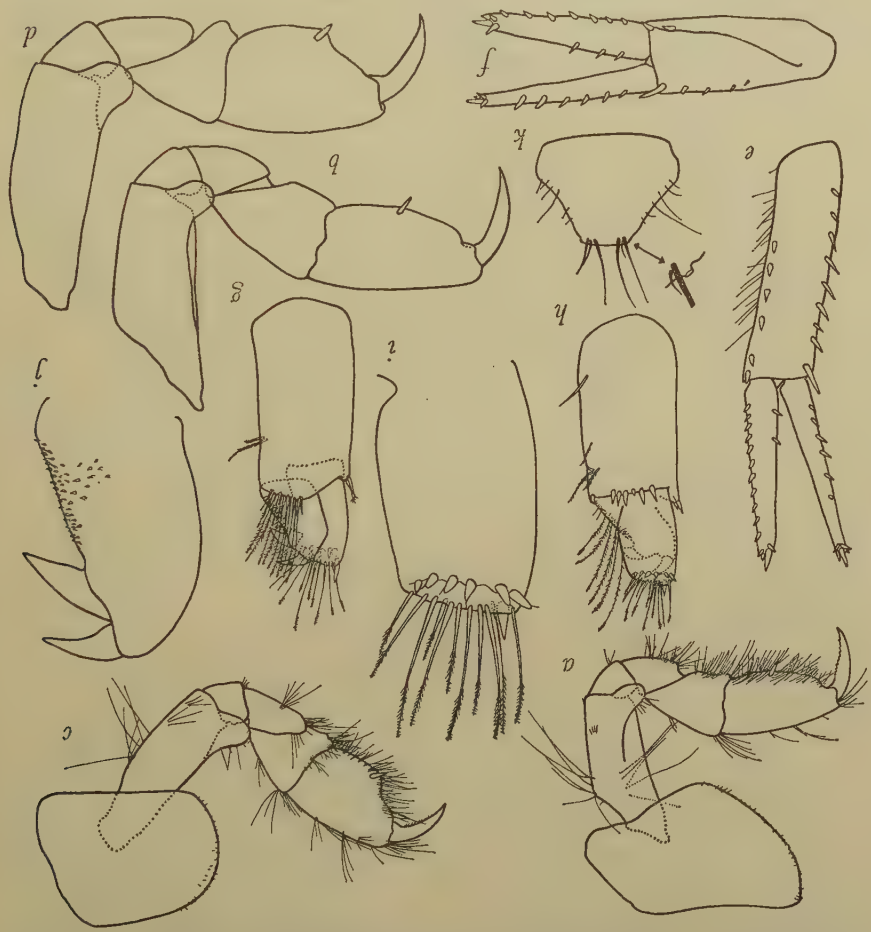

FIGURE 16.—*Ampithoe ramondi* Audouin, female, 11.0 mm., sta. 6206: *a*, *b*, gnathopod 1; *c*, *d*, gnathopod 2; male, 11.5 mm.: *e–h*, uropods 1, 2, 3, 3; *i*, *j*, inner and outer rami of uropod 3; *k*, telson.

Ampithoe simulans Alderman

FIGURES 17, 18

Ampithoe simulans Alderman, 1936, pp. 68–70, figs. 44–47.—J. L. Barnard, 1954, pp. 33–34, 1 fig.

?*Amphithoe corallina* Stout, 1912, pp. 134–136, figs. 76–77.

Diagnosis: Second and third pleonal epimera with a faint suggestion of a point at the lower posterior corners; article 5 of male gnathopod

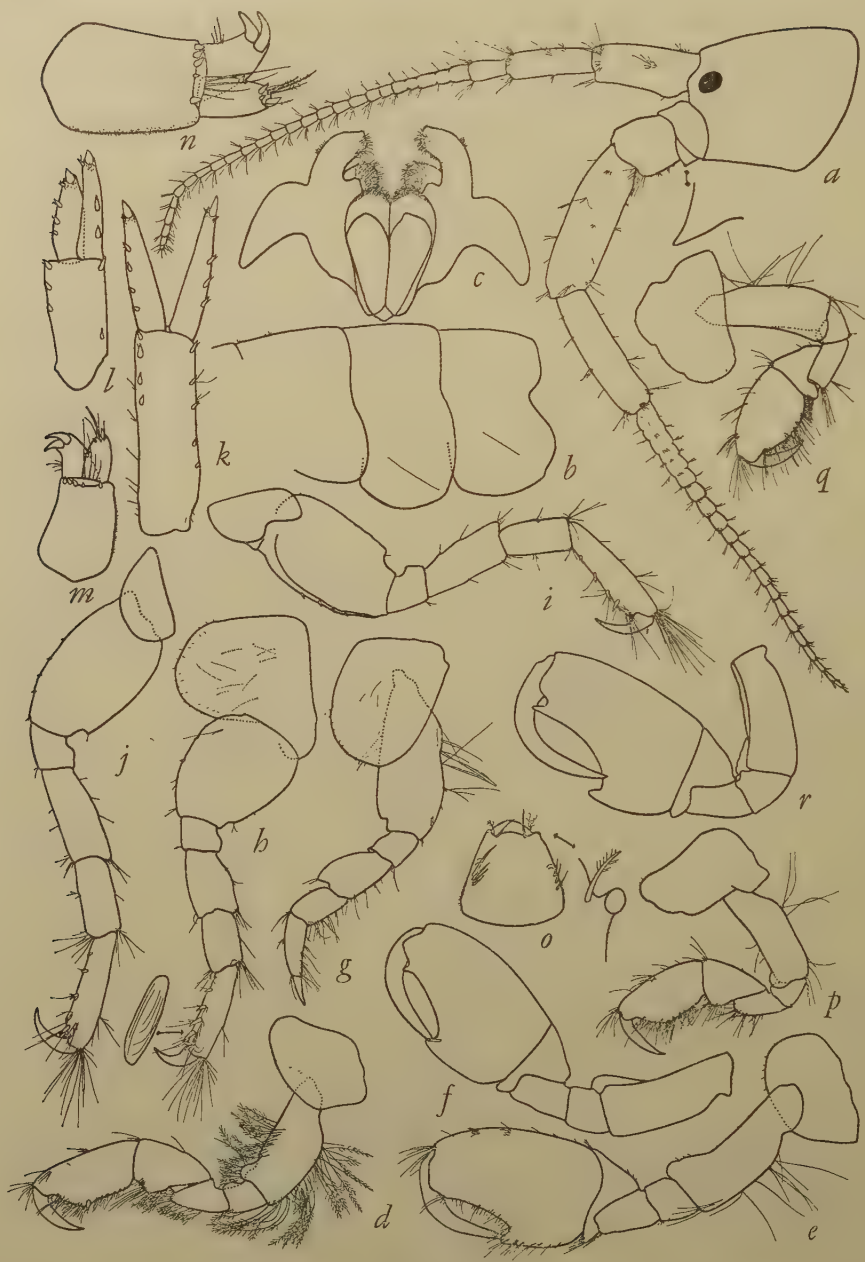

FIGURE 17.—*Ampithoe simulans* Alderman, *a–o*, male, 13 mm., sta. 1463: *a*, head, enlargement shows ventral surface of gland cone projecting medially; *b*, metasome; *c*, lower lip; *d*, gnathopod 1; *e*, *f*, lateral and medial views of gnathopod 2; *g–j*, pereopods, 1, 3, 4, 5; *k–n*, uropods 1, 2, 3, 3; *o*, telson; female, 9 mm., 8–29–50, coll. J. L. Mohr: *p*, *q*, gnathopods 1, 2; male, 11 mm., same sample: *r*, gnathopod 2.

1 shorter than article 6, posterior edge of article 5 with a shallow, broad hind lobe, palm oblique; articles 2–5 strongly setose; male gnathopod 2 with palm quite oblique, excavated to form a short thumb at defining corner which increases in extension with the elongation and further disproportion of the palm, a small process near the finger hinge increasing in development also; dactylus fitting palm in young males, failing to fit palm in old males; article 2 of pereopods 1–2

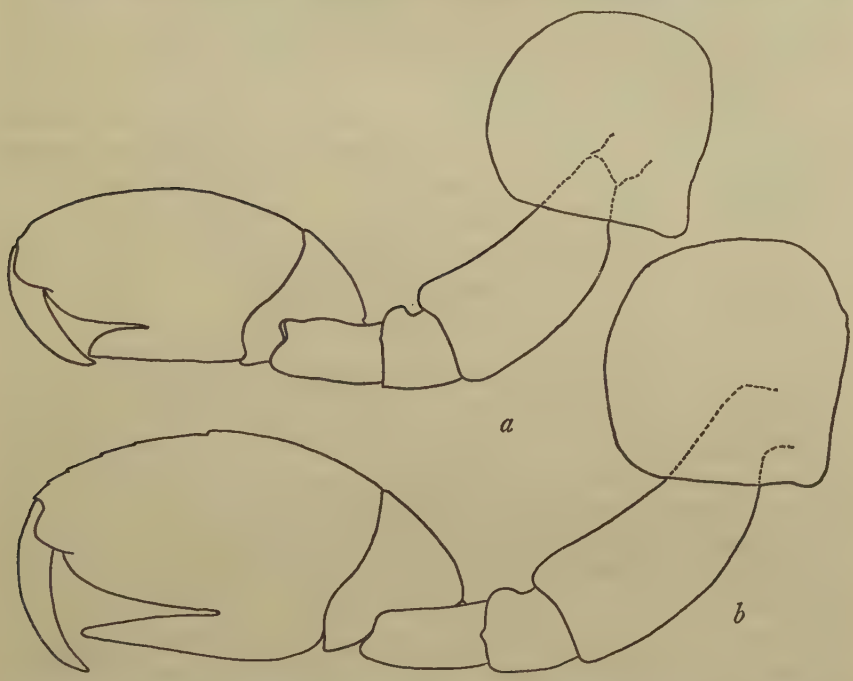

FIGURE 18.—*Ampithoe simulans* Alderman, aberrant specimens similar to *A. pollex* in second gnathopodal morphology: *a*, male, 8.0 mm., Barnard sta. 40–A; *b*, male, 9.0 mm., Barnard sta. 40–A.

about 2.5 times as long as broad; ventral edge of antenna 1, article 1 not spiniferous; antenna 2 longer than antenna 1, flagellum of antenna 1 longer than that of antenna 2, flagella both poorly setose; outer apical lobule of lower lip slightly longer than inner lobule, the two small apical spines on sixth articles of the pereopods are fluted (see figures); coxae 1 and 2 scarcely half as long as coxae 3–5; peduncular process of uropod 1 vestigial.

Female: Article 5 of gnathopod 1 shorter than article 6, the appendage not as setose as on male; article 5 of gnathopod 2 like that of male gnathopod 2, much shorter than on gnathopod 1, with a narrow hind lobe.

Material: Reported by Barnard, 1954. *Velero* stations 1463 (1), 1489 (1). Barnard station 40 (2).

Records: Coos Bay, intertidal; North Bay, Cape Arago State Park, Oreg., intertidal. Coal Oil Point, near Goleta, Calif.

Remarks: Possibly *Ampithoe corallina* represents a senior synonym of this species. The shape of the lower lip and gnathopod 1 correspond well with the female of *A. simulans* but Stout draws a small point on the third pleonal epimeron, possibly giving indication that *A. corallina* belongs with *A. lacertosa*. In any case the second antenna is not typical of either species and more search must be made for animals corresponding with Stout's figures.

Two aberrant male specimens from Barnard station 40 are figured to show the aspect of gnathopod 2 similar to *A. pollex;* however, their lower lips are those of *A. simulans*.

Distribution: Oregon to Coal Oil Point, southern California.

Ampithoe tea, new species

FIGURES 19–21

Diagnosis: All pleonal epimera rounded behind and at lower corners, no lateral ridges; articles 5 and 6 of male gnathopod 1 equal in length, posterior edge of article 5 with a truncated, rather shallow hind lobe, article 6 narrow, sublinear, palm transverse, finger overlapping palm by its full length; gnathopod 2 in male undergoing extensive differentiation, commencing with a finger about half as long as article 6 and the palm slightly excavated, scarcely defined and quite oblique, through several stages until the finger is as long as article 6, fitting the entire hind edge of article 6, which forms the palm, the palm developing a process near the finger hinge, followed by a shallow excavation and then a relatively straight but sloping edge, the palmar edge minutely crenulated; the finger becoming increasingly bent at its base; article 2 of gnathopod 2 with poorly developed distal bump; article 2 of pereopods 1 and 2 strongly inflated, 1.9 times as long as broad; article 2 of pereopod 3 broader than long; ventral edge of article 1 of first antenna not spiniferous; antenna 1 much longer than antenna 2, the flagellum of antenna 1 more than four times as long as that of antenna 2, the latter flagellum rather short, 0.5 times as long as article 5 of peduncle, and the second antenna rather setose; article 4 of peduncle 120% as long as article 5; outer apical lobule of lower lip somewhat longer than medial lobule; coxae 1 and 2 shorter than 3 and 4 but not broadened, coxa 1 not produced forward; peduncular process of uropod 1 long.

Female: Article 5 of gnathopod 1 shorter than article 6 and thus shorter than in the male; gnathopod 2 with article 6 similar to that of

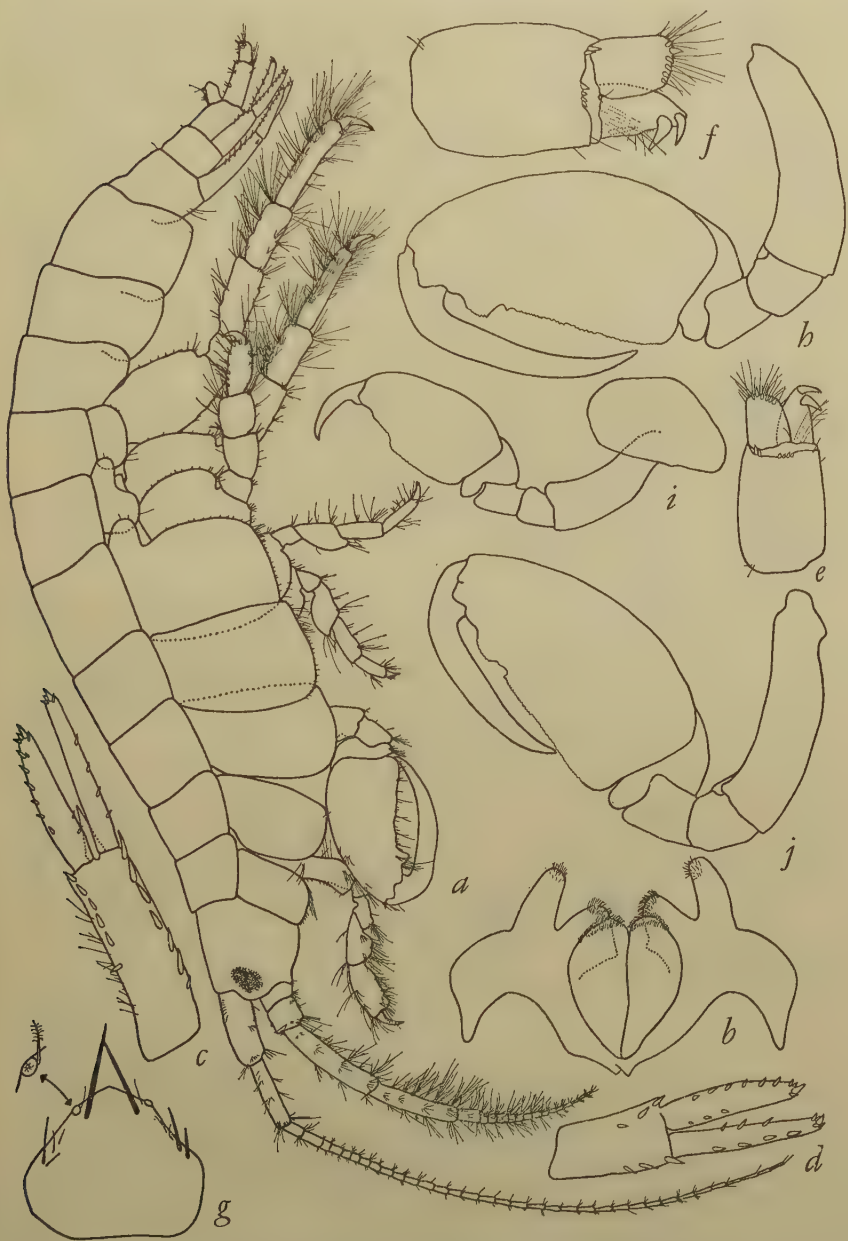

FIGURE 19.—*Ampithoe tea*, new species, male, holotype 12.0 mm., sta. 1870: *a*, lateral view; *b*, lower lip; *c–f*, uropods 1, 2, 3, 3; *g*, telson; male, 10 mm.: *h*, gnathopod 2; male, 6.0 mm.: *i*, gnathopod 1; male, 8.0 mm.: *j*, gnathopod 2.

FIGURE 20.—*Ampithoe tea*, new species, male, holotype, 12 mm., sta. 1870: *a*, *b*, gnathopod 1; *c-e*, gnathopod 2; *f-j*, pereopods 1, 2, 3, 4, 5.

gnathopod 1 in both sexes but stouter and less linear, article 5 shorter than 6 and with well-developed hind lobe that is relatively stouter than that of male gnathopod 2; antenna 2 poorly setose.

Holotype: Allan Hancock Foundation No. 4921, male, 12.0 mm.

Type locality: *Velero* station 1870, 0.2 mi. NE. of Willow Cove, Santa Catalina Island, 33–22–17 N., 118–20–55 W., 21 fms., dredge, kelp, Aug. 25, 1949.

Material: *Velero* stations 1221 (2), 1370 (2), 1375 (1), 1381 (7), 1407 (1), 1453 (3), 1623 (1), 1870 (122), 1871 (44), 1924 (3), 2080 (13), 5369 (7), 6695 (37), 6696 (2), 6803 (15). Barnard stations 33 (7), 37 (1), 39–J–1 (?16), 39–K–1 (11).

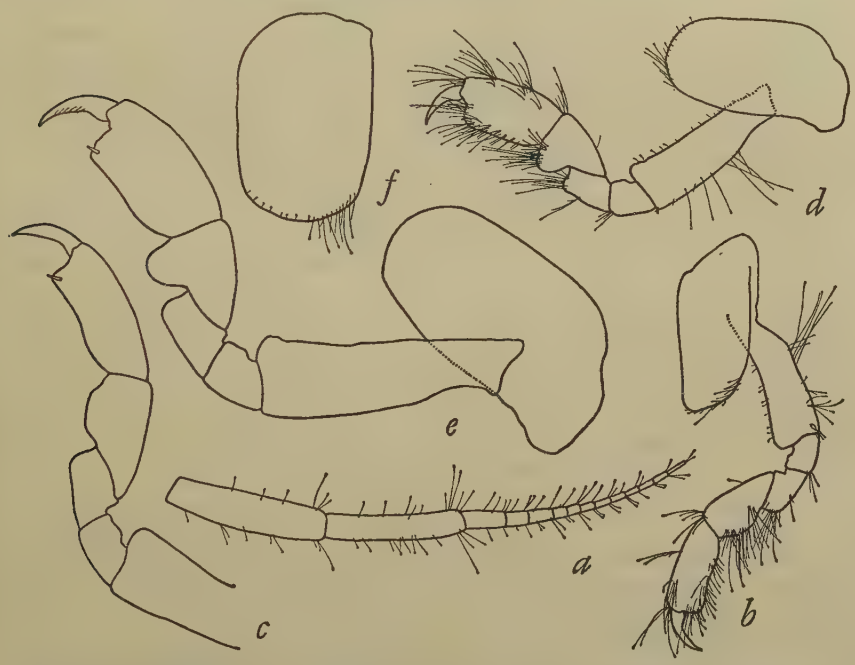

FIGURE 21.—*Ampithoe tea*, new species, female, 8.5 mm., sta. 1870: *a*, antenna 1; *b*, *c* gnathopod 1; *d*, *e*, gnathopod 2; *f*, coxa 3.

Records: California, intertidal: Santa Catalina Island; Coal Oil Point; Corona Del Mar. Santa Catalina Island, several localities, 18–37 fms.; near Point Conception, 2–3 fms.; off Santa Barbara, 9 fms.; off Laguna Beach, 10 fms.; La Jolla, 1 fm.: 20 miles east of Punta Eugenia, Baja California, intertidal; Guadalupe Island, Baja California, 25 fms.

Relationship: This material differs from *Ampithoe eoa* Gurjanova (1938 and 1951) by the equally broad fifth and sixth articles of pereopod 5, by the development of a palmar process near the finger

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hinge of gnathopod 2, and by the much more slender second gnathopod of the female having a transverse, not oblique and slightly sinuous palm.

From *A. mea* Gurjanova (1938 and 1950) this species differs by the development of a palmar process on male gnathopod 2, the broader second article of pereopod 3 and the more slender female gnathopod 2 with transverse palm. The present material corresponds with *A. mea* in the strongly setose second male antenna; the male gnathopod 2 figured by Gurjanova could be one stage of the development in the present material. The female gnathopod 2 shown by Gurjanova, however, is most distinct; otherwise I should assign this material to that species. Possibly her "female" was a young male.

From *A. annenkovae* this material differs again by the female second gnathopod, which in that species is quite large and well developed, and the male gnathopod 2 of *A. mea* has a series of small protuberances along its palm, not just one near the finger hinge.

The possibility exists that the three species mentioned above may represent stages in a single growth series and that the females described for each of the species above are stages of old age. For the present, these materials must be segregated from those mentioned above.

Ampithoe orientalis, as redescribed by J. L. Barnard (1955) is very similar, but article 6 of gnathopod 1 is more slender, and the fully developed process at the distal end of the palm is not sculptured as fully as in *A. tea*.

Ampithoe valida Smith

FIGURES 22, 23

Amphithoë [sic] *valida* Smith, 1873, p. 563.—Paulmier, 1905, pp. 164–165, fig. 34.
Ampithoe valida, Alderman, 1936, p. 68.—J. L. Barnard, 1954a, pp. 34–35, pl. 31 —Nagata, 1960, 176, pl. 16, figs. 97–98.
Ampithoë shimizuensis Stephensen, 1944, pp. 77–80, figs. 27–28.

Diagnosis: Second and third pleonal epimera with very slight points at lower posterior corners; article 5 of male gnathopod 1 slightly longer than article 6, posterior edge of article 5 forming a broad hind lobe with a distal projection, article 2 strongly setose, palm oblique; gnathopod 2 with large rounded lobes on articles 2 and 3, article 5 with narrow hind lobe, article 6 elongated, rectangular, palm transverse, bearing a quadrate middle bump, finger curved, fitting palm; article 2 of pereopods 1–2 about 2.5 times as long as broad; ventral edge of article 1 on antenna 1 bearing setae, no spines; antennae 1 and 2 equal in length, flagellum of antenna 1 twice as long as that of antenna 2, neither flagellum strongly setose; apical lobules of lower lip so broad and appressed that they mask their separating

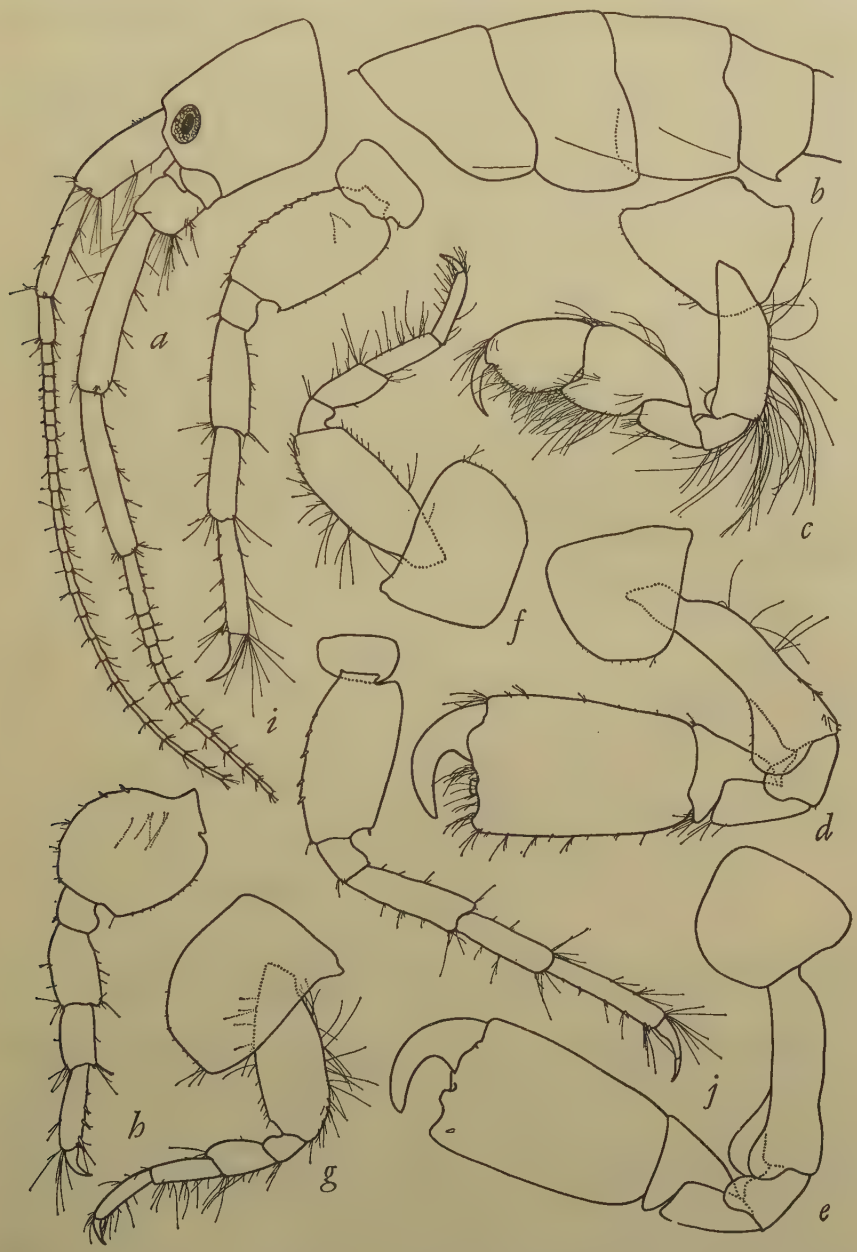

FIGURE 22.—*Ampithoe valida* Smith, male, 10.0 mm., Coos Bay, Oreg.: *a*, head; *b*, metasome; *c*, gnathopod 1; *d*, *e*, gnathopod 2; *f-j*, pereopods 1, 2, 3, 4, 5.

incision, both projecting equally; coxa 1 produced forward; peduncular process of uropod 1 vestigial.

Female: Gnathopod 1 unlike that of male, article 5 shorter than 6 and with an unmodified hind lobe, gnathopod 2 with sixth article like that of first gnathopod, but stouter; antenna 1 slightly longer than in male, hence both pairs of antennae are more unequal in length.

Material: *Velero* station 1453 (1).

Record: Off Newport Bay, Calif., 6–18 fms.

FIGURE 23.—*Ampithoe valida* Smith, female, 12.0 mm., Coos Bay, Oreg.: *a*, *b*, gnathopods 1, 2; male, 10 mm.: *c*, lower lip; *d-g*, uropods 1, 2, 3, 3; *h*, telson.

Remarks: Stephensen's figures show sufficient distinctions that subspecific rank might be held for the Japanese population; the female second antennae are heavily setose and the male first gnathopods have article 5 shorter and without the posterior lobe produced distally, but Nagata (1960) confirms that article 5 appears as shown herein.

Distribution: Atlantic Ocean: Long Island and New Jersey. Pacific Ocean: Japan at Shizuoka Prefecture; Oregon; California south to Newport Bay.

Ampithoe species

FIGURES 24, 25

Refer to: *Amphitoe* [sic] *mea* Gurjanova, 1938, pp. 361–364, fig. 53; 1951, pp. 882–885, fig. 616. *Ampithoe eoa*.—J. L. Barnard, 1954, pp. 27–28, pls. 25–26 (not Gurjanova 1938).

Diagnosis of present material: All pleonal epimera rounded behind and at lower corners, no lateral ridges; article 6 of male gnathopod 1 longer than article 5, posterior edge of article 5 with a rounded, scarcely truncated, shallow posterior lobe, article 6 narrow, sublinear, palm transverse, finger overlapping palm by its full length; gnathopod 2 of male in a state of intermediacy compared with *Ampithoe tea*, new species, finger about half as long as hind edge of article 6, palm not distinct, the hind edge of article 6 minutely serrate, with a slight notch near distal end, article 2 with a poorly developed distal bump; article 2 of pereopods 1–2 strongly inflated, 1.6 times as long as broad; article 2 of pereopod 3 broader than long; ventral edge of article 1 of first antenna with a few distal slender spines; antenna 1 much longer than antenna 2, the flagellum of antenna 1 about 3 times as long as that of antenna 2, the latter flagellum short, 1.3 times as long as article 5 of peduncle, articles stout, antenna 2 well setose, article 4 of peduncle about 90% (aberrantly 60% as in figured male) as long as article 5; outer apical lobule of lower lip somewhat longer than medial lobule; coxae 1 and 2 shorter than 3 and 4 but not broadened, coxa 1 not produced forward; peduncular process of uropod 1 long.

Female: Article 5 of gnathopod 1 shorter than article 6; gnathopod 2 with article 6 similar to that of gnathopod 1 in both sexes but stouter and less linear, article 5 shorter than 6 and with well-developed posterior lobe that is narrower than in *A. tea*, new species.

Material: Barnard station 5 (5).

Record: Corona del Mar, Calif., intertidal.

Remarks: The specimens differ from the figures of *A. mea* Gurjanova (and *A. eoa* Gurjanova) in the female second gnathopod, having a transverse palm with a strongly overlapping finger. In *A. mea* the female second gnathopod has an oblique, excavated palm with the finger fitting it and a longer fourth article of antenna 2. I suggest the possibility that *A. mea* females shown by Gurjanova may be either aberrant, gerontic females commencing to demonstrate male conditions or subadult males. The correspondence of *A. annenkovae* Gurjanova (see 1951) to *A. mea* is striking. The male and female second gnatho-

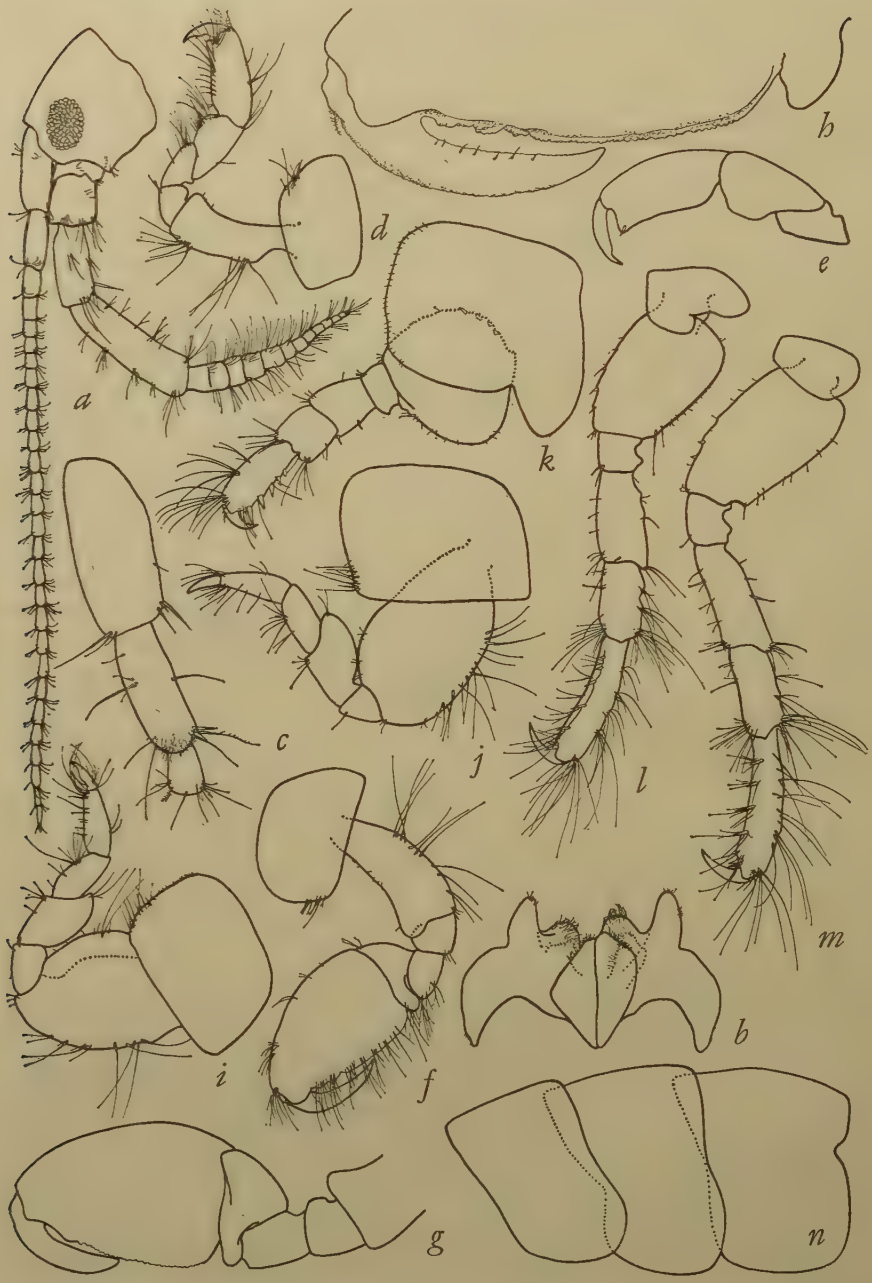

FIGURE 24.—*Ampithoe* species, male, 8.0 mm., Barnard sta. 5: *a*, head; *b*, lower lip; *c*, peduncle of antenna 1; *d*, *e*, gnathopod 1; *f-h*, gnathopod 2; *i-m*, pereopods 1, 2, 3, 4, 5; *n*, metasome.

pods are simply later growth stages if one considers that *A. mea* undergoes the same terminal development seen in other Ampithoes. If those two species prove to be the same, then the female second gnathopod may be normal in *A. mea* and the present material would have to be established nomenclaturally.

A. eoa has a broadened fifth article of pereopod 5 and longer and more truncate article 5 of male gnathopod 1.

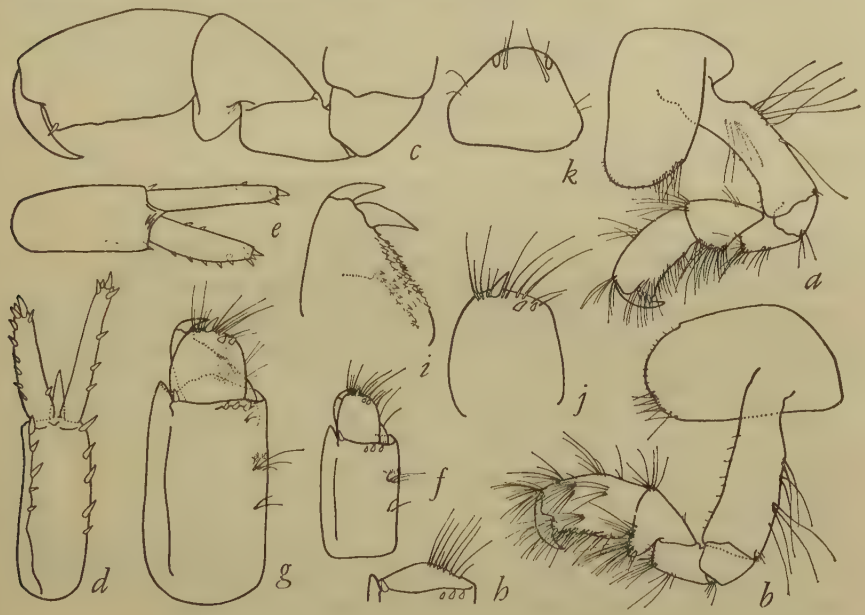

FIGURE 25.—*Ampithoe* species, female, 9.6 mm., Barnard sta. 5: *a*, gnathopod 1; *b*, *c*, gnathopod 2; male, 8.0 mm.: *d–g*, uropods 1, 2, 3, 3; *h*, end of peduncle of uropod 3; *i*, *j*, outer and inner rami of uropod 3; *k*, telson.

Ampithoe orientalis, as redescribed by J. L. Barnard (1955), has a somewhat more slender sixth article of gnathopod 1 and an elongated, slender, second antenna.

The second gnathopod of the female *A. annenkovae* (see Gurjanova, 1951) is enlarged somewhat as in the male and has an oblique palm.

The material identified by Barnard (1954) as *A. eoa* differs from that species in the structure of pereopod 5 and by the equal lobation of the lower lip. Except for the male gnathopods, that material might be confused with *A. lindbergi*. Both *A. mea* and the present material have the unequal lobation of the lower lip; hence *A. eoa* of Barnard (1954) is unassignable to a known species, but is not worthy of designation until more Oregonian materials can be studied. Because only 5 specimens of the present material are known from the coast of southern California and they have the aspect of the northern

Ampithoes, it is presumed they represent a marginal population that will find assignment to a northern species. The aberrancy of the shortened fourth article of antenna 2 of one of the males indicates the marginality of the deme.

In summary, these several populations of closely related ampithoes are now recorded, but relationships and taxonomic assignments are still unclear: *Ampithoe mea* Gurjanova, *A. eoa* Gurjanova, *A. annenkovae* Gurjanova, *A. eoa* of Barnard (1954), the present material of *Ampithoe* species, *A. tea* Barnard, new species, and *A. plea* Barnard, new species.

Genus *Cymadusa*

Acanthogrubia Stout, 1912, p. 143.

Cymadusa uncinata (Stout), new combination

FIGURES 26–28

Acanthogrubia uncinata Stout, 1912, p. 146, figs. 81–83.
Paragrubia uncinata.—Shoemaker, 1941, p. 188.—Hewatt, 1946, p. 199.

Diagnosis: Male gnathopod 2 with palm nearly transverse and bearing a deep slit that splits off a large posterior tooth; accessory flagellum 3–5 articulate.

Material: *Velero* station, 878–38 (3). Barnard station 41 (100+).

Records: Goleta and Anacapa Island, Calif., 2 and 15 fms.; at Goleta collected from holdfasts of *Macrocystis pyrifera.*

Relationship: This is the only species of the genus to have the large tooth of gnathopod 2, and so it is remarkably distinct from its relatives. Apparently this is the largest amphipod species on the coast of southern California, reaching a length of 35 mm.

Shoemaker transferred this species to *Paragrubia*, but it belongs with *Cymadusa* because gnathopod 1 is smaller than gnathopod 2, the reverse of the condition of *Paragrubia.*

Distribution: Southern California.

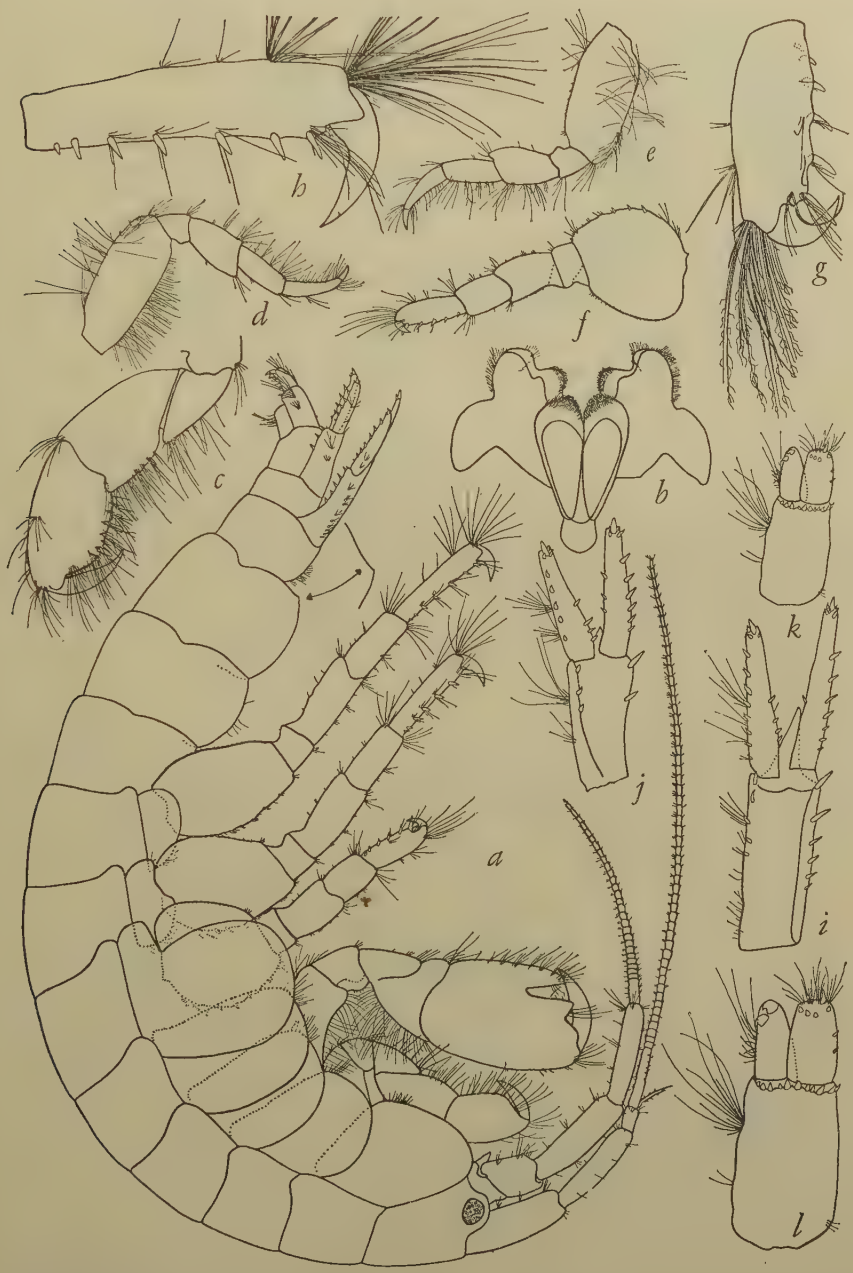

FIGURE 26.—*Cymadusa uncinata* (Stout), male, 20 mm., Barnard sta. 41: *a*, lateral view; *b*, lower lip; *c*, gnathopod 1; *d*, *e*, pereopods 1, 2; *f*, *g*, pereopod 3; *h*, pereopod 5; *i–l*, uropods 1, 2, 3, 3.

FIGURE 27.—*Cymadusa uncinata* (Stout), female, 30 mm., Barnard sta. 41: *a*, upper lip; *b*, mandible; *c*, *d*, maxillae 1, 2; *e*, maxilliped; *f*, inner plate of maxilliped; *g*, end of maxillipedal palp; *h*, *i*, gnathopod 1; *j*, gnathopod 2; *k*, outer ramus of uropod 3; *l*, telson.

FIGURE 28.—*Cymadusa uncinata* (Stout), female, 30 mm., Barnard sta. 41: *a*, medial view of gnathopod 2; male, 20 mm.: *b*, *c*, lateral and medial views of gnathopod 2; developmental stages in male gnathopod 2: *d–i*.

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